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EDITORIAL NOTES.

The Profits of the Coalowners.

NOT once in the correspondence that has been passing in our columns between "Coal Fitter" and Mr. Charles Carpenter has the former acknowledged that the British nation has a prior claim to foreign countries upon its native natural product coal. His argument throughout has been one for the broadest possible freedom for coalowners to utilize their extraordinarily good position in the matter of quality to expand to the utmost degree the British coal business abroad, even (as we interpret his writings) to the extent of maintaining a high level of prices in this country, in order that the foreigner may not have to pay on a somewhat higher scale for British coal, which exports in recent and current times indicate he is quite willing to do to secure what he needs. It is against the economic interests of the British nation that it should be subservient to the uncontrolled appetite of the coal owners for profits, and to the unfettered requirements of the foreigner for British coal. "Coal Fitter's" case entirely breaks down when we see that, notwithstanding the six weeks' idleness of the pits last year, coal exports only receded by about 0·25 per cent., while the value of the decreased quantity shipped increased by about 10 per cent. We believe fully in the sacredness of contracts; we believe, too, in the sacredness of the right of the British nation to expect that every Britisher will do his part, in the hour of the nation's exigent needs, towards looking after its interests, and not showing preference to other countries.

The coalowners themselves have created the case for the intervention of the Government to defend the country against those who deal in the chief item of its subterranean wealth. Whatever the Royal Commission on Coal Supplies may have said some eight years ago has to be read in the light of what has transpired since, and especially in the course of the last year of the eight. The incidents of that year for which this country had to pay dearly, and from which the colliery proprietors profited hugely, have entirely changed the aspect of affairs which the Commissioners had submitted to them more than eight years ago as representing the economic side of this matter of export. The quotation from the report of the Commissioners upon which, in his letter last week, "Coal Fitter" places so much weight is not a presentment of their own deliberate views, but merely a digest of the points put before them by some of the interested witnesses. The Commissioners, with excellent discretion in the cited paragraph, relieved themselves from directly endorsing the views by the use of the expressions: "It is said," and "it was pointed out." Another feature of "Coal Fitter's" last letter is that, while he does not concede the existence of any combination among the coalowners to determine prices, he does admit, indirectly, if not precisely, that there are understandings as to the extent of increases in price. The one thing works out to much the same as the other; and therefore there is not anything to be gained by cavilling over terms such as "combinations" or "understandings." There is no use in attempting to mask the obvious by ambiguous references, or by inquiry for stronger evidence.

Remark has been made upon the fact that, despite the cessation of colliery work for six weeks last year, the conditions promoted by the strike gave the coal owners an opportunity that the normal operation of the law of supply and demand could not possibly have given them; and they have taken the opportunity of securing a full pound of flesh, and over, out of the British nation and its industries. The year proved that a strike which, for the time being, has an exhausting effect on the country, is an excellent thing financially for coal proprietors. The "Financial Times" has published figures for the year relating to the profits of nineteen colliery companies. In the case of only five out of the nineteen was a decrease in net profit recorded; the total being under £40,000. The remaining fifteen concerns registered an aggregate improvement of £420,000, or nearly 80 per cent. Grouping the nineteen companies, the gain spread over them all was at the rate of 46 per cent. Unfortunately, the full effect of the year's gain cannot be gauged from the figures quoted by our financial contemporary, inasmuch as the totals are hidden by the withdrawals for depreciation, reserve, and debenture interest. One of the collieries paid 27½ per cent., compared with 12½ per cent. in 1911; another 20 per cent., as against 10 per cent. in 1911; a third 20 per cent., compared with 5 per cent. in 1911; to a fourth the same figures apply; and a fifth company paid 30 per cent., against 11¾ per cent. These are the most favoured in the group. The increases in the case of the others are lower; and the one or two concerns that did not make anything for the ordinary capital appear to be the weaklings in the matter of volume of business. But with a six weeks' strike, with all the moaning there has been over the increased costs imposed by legislation, the figures show that the colliery proprietors have well looked after themselves; and yet the figures do not disclose the whole of the tale. Those who invest in gas enterprise under statutory control think themselves well off if they get a clear 4¾ per cent. on their investment; if 5 per cent. clear, they consider they have done remarkably well. Though "Coal Fitter" cannot see that it would be just on the part of Parliament to protect the British public and industry against a trading condition applying to a native natural product in which the law of supply and demand operates in an irregular manner ill-befitting a "law," there is another view of the matter besides his, and that view is the national one.

The Dignity and Responsibility of Gas Engineering.

ONE of the best incentives to the juniors of the gas industry to make themselves thorough masters of the science and art of gas engineering is to have a proper individual conception and appreciation of the high position that gas engineering holds. If the junior is allowed to grow in the belief that the work of gas engineering has now reached such a level of standardization that engineering requirement ends at the capacity for selection, taking care of plant, and operating it, it will be a bad thing both for himself and the undertaking he serves, as well as, in the degree that the notion rules, to the gas industry at large. We would earnestly advise every junior, whatever his belief in this regard, to read from beginning to end the address that Mr. T. Goulden, the Chief Engineer of the Gaslight and Coke Company, delivered to the Southern Junior Gas Association last Friday. Any junior who, in the way already indicated, degrades in thought the dignity and position of gas engineering cannot possibly leave the address without having such a thought disturbed, and fresh light penetrating his intelligence; no junior who holds brighter views as to the important place occupied by gas engineering will finish reading the address without having those views hardened, and with a determination to aspire to that high engineering efficiency that Mr. Goulden, from his large experience, knows to be essential. The man who has had Beckton under his charge, and is now the Chief Engineer of the Gaslight and Coke Company, has cognizance of the conditions of the gas industry throughout, and has a mature knowledge of the gas engineer's requirements from beginning to end.

Gas "engineering" must never again be allowed to descend to the condition in which the formulæ of tradition governed action. Such a state is to-day repugnant to the vast development of the industry on all sides. Mr. Goulden went over the ground of changed circumstances on the works, to show how the change has elevated both the status and the responsibilities of the engineer. The reader (though in the opening part of the address he will not find anything new) may be strongly advised not to skip it, but to read it all, in order that his impressions may expand with the spirit and lines of the composition. The transition from manual to mechanical and more scientific operation on gas-works, the utilization to a greater extent of natural forces,

the requirements as to design occasioned by the changes and greatly increased capacities, the changes owing to new methods in the location of heavy weights of material producing new building considerations, the transmission of material mechanically, and much else of large importance have brought about the need for the real gas engineer having the qualifications of a civil engineer, and not merely those of one whose ability extends to the selection, tending, and operating of plant. It cannot, however, be expected that all gas undertakings can afford to pay for a chief officer of such qualifications. Mr. Goulden does not suggest it. But all such gas undertakings can afford (for they will find it a good expenditure) to have the advice and services of fully qualified engineers when important works' changes are being effected. But under current conditions all gas undertakings that can do so should have a fully trained and capable engineer, whose work is governed by something higher than empiricism. The gas engineer has not only to play a greater part as a designer and constructional engineer, but he has costly and intricate plant under his care to-day; and his responsibility is infinitely greater than in the past in laying a reliable engineering foundation from which to raise the continued success of his undertaking. Therefore, said Mr. Goulden, "I cannot too strongly dwell "upon the primary necessity of engineering ability as a "basis on which to build success." The case is too strong for any valid opposition to such submissions. "Wise ex- "penditure is a cardinal point in the production of cheap "gas," said Mr. Goulden, among many other aphorisms, and he illustrated this by citing the divergencies that exist to-day in the capital charges per 1000 cubic feet—divergencies representing in some cases several pence on the price of gas. There are many works to-day whose capital accounts are the best possible condemnation of a past erroneous policy of, when spending money, dispensing with talented and sober advice.

We say "sober" advice, by which we mean reasonable and practical advice; for Mr. Goulden speaks of works of the first magnitude in which engineering science has run riot, and in which mechanical appliances have been installed with complete disregard of the cost of installation. He also says that the task of the gas engineer is not to supply "engi- "neering monuments." We do not agree with the application of the term "engineering science" to a condition of things in which commonsense and practical considerations have been strangled in a mad flight to excesses; nor do we agree that it is not the task of the gas engineer to supply himself with an engineering monument. The best engineering monument that the gas engineer can have is a works carrying a reasonable capital expenditure, and showing economy in production, and a good return on investment. The extremes to which Mr. Goulden referred are monuments to engineering folly—a somewhat different thing, and a thing which real and well-balanced engineering ability should enable the engineer to avoid.

There are several other subjects treated upon in the address—the calorific power of gas, the selection of power for driving, the utility of carburetted water gas, co-partnership in gas-works, and much else; but of all, the main theme in the address was that of the scope and necessity for the best engineering ability in our industry. And on this point Mr. Goulden takes an impassioned view. He occupies a prominent place in the gas profession. But he is a thinker and worker whose natural reserve keeps him from publicity. He is indeed a model of that self-effacement of which he speaks, but which in the causes of conference and advance can be carried too far. Mr. Goulden, however, is not in anything an extremist. He is (as we have found, and know full well) always ready to be helpful; and as to his own work as Chief Engineer of the Gaslight and Coke Company, the results that issue from it are a recurring testimonial to its value. He places gas engineering on a high plane. He wants to see it more firmly established there by impressing on the juniors its dignity and responsibility. "We may claim for gas engineering that it is one of the "branches of civil engineering which is followed for the "public benefit; and it is clearly our duty to raise the "branch of the profession we have chosen to follow, and to "preserve and to enhance its status and our own in the "engineering world by all means in our power." These were Mr. Goulden's own words; and the injunction that they contain, coming from the Chief Engineer of the Gaslight and Coke Company, will not be lost upon the juniors of the gas industry.

Competent Engineering Advice.

Naturally, Mr. A. G. Drury's report on the Ilkeston gasholder disaster has been the main subject of conversation during the past week where gas engineers have met; and his outspoken remarks as to the relations of gas-plant purchasers and contractors, and as to the necessity in large engineering contracts of the former having competent engineering advice, have, we believe, met with a larger amount of approval than we had calculated upon. There are contracting firms who are not at all averse to (on the contrary welcome, in connection with considerable engineering constructions) the sharing of responsibility with a competent engineer advising the purchasers, rather than have it all placed upon their own shoulders. For them, the responsibility is the greater, the keener the competition. This, however, is not a new question. It is, in fact, a very old one, and is only now revived by the force of a calamitous event, after the system against which Mr. Drury protests and warns has grown to large dimensions. If anyone who has Mr. F. S. Cripps's book, "Gasholder and Tank Construc- "tion," published in 1898, will turn to the addendum, he will find that the author points strongly to the unwisdom of those who, administering gas undertakings, and not having a thoroughly trained engineer at the head of their own staff, obtain large and costly plant without consulting a trained engineer. The fees of the consulting engineer, among parsimonious administrators, or those entertaining erroneous notions as to economy, are undoubtedly one obstacle to the engaging of his competent services; but Mr. Cripps, whose experience extends from the plant manufacturers' establishment to the consulting engineer's office and private practice, stated nearly fifteen years ago that the actual cost of the work is enhanced when the makers are expected to act both as consulting engineers and designers. The money is spent somewhere; and, as a matter of fact, without efficiency in planning and designing, there may be unnecessary material expenditure, which would more than meet the services of the consulting engineer.

Of course, there are two sides to the question. There are contractors who can point to fads and whims of consulting engineers that have raised the cost of certain work. There are experienced and practical consulting engineers; and there are inexperienced and very unpractical consulting engineers. But it is quite easy to discriminate between them. So that the fact that there are some consulting engineers whose services it is better to dispense with than engage does not constitute a sufficient argument against the more important submission that safety of life and property comes first. It is in this direction that we find concentrated the highest responsibility—a responsibility that should be recognized by the administrators of gas undertakings, and their officers (when those officers are not themselves trained engineers), as well as by contractors. We are afraid the fees of the consultant alone are not, in some cases, wholly responsible for the refusal to obtain his special advice upon, or his services in planning or endorsing, schemes, as the fact that not every gas manager who is not a trained engineer can bring himself to let his Board or Committee know that his engineering capacity does not extend to the higher branches of the art and science, such as must of necessity be brought to bear upon the designing of such a structure as a gasholder. But it will not do to let dignity override economic construction, combined with safety, durability, and good service.

In our article last week on the subject of Mr. Drury's report, reference was made to the views of one consulting engineer expressed in our columns at the time of the Ilkeston inquiry, as supplying one good reason why thoroughly competent engineers should be consulted in connection with large engineering structures, each one of which varies from others in some inherent respect or in local circumstances. What induced that consulting engineer to give expression to those views was that, in his opinion, there was at the inquiry much that was unsatisfactory said about the "factor "of safety" in the tank, which factor of safety referred only to the strain caused by the water pressure; and little was said as to the stresses induced by the holder itself. The importance of this point, and the necessity for its reference to the competent engineer, hardly need emphasizing to-day. But it may not be wasted time to ponder over it a little. It is plain that, through the medium of the gasholder bell, all the stresses due to side pressure of wind, snow, friction (produced by imperfect fit, temperature, structural stresses,

distortion, and what not) are communicated to the tank—thus reducing the factor of safety to far below the figures mentioned at the inquiry. By how much? That is a question that can only be answered by the competent engineer with all the essential facts ascertained and before him for investigation. Unless the magnitude of the whole of the stresses caused by all the forces that the structure, whatever its design and proportions, may be called upon to resist are determined, and provision be made for meeting them, there can be no complete confidence in the stability of the structure. There is work there for the engineer who is competent to undertake it; and it is necessary work.

We do not think that any one will make open avowal of hostility to Mr. Drury's criticism of a practice that has grown, and has become rather strongly established, and which system is not in the interests of engineering, and certainly not in the interests of buyers or contractors—of contractors both on the score of responsibility, and on that of a firm ground for competition. Where there is competition among contractors and not competent supervision on the side of the purchasers, there must be a strong temptation to skimp designs to get in lower prices. Safety especially therefore demands a cessation of the practice of ignoring, by one of the parties to a contract for large plant, independent competent advice or amendment of a design. To that effect, Mr. Cripps wrote in 1898. Sir George Livesey entertained similar views; and Sir Corbet Woodall made the subject a point in his recent address to the Society of British Gas Industries.

American Experience with Intermittent Verticals.

In other columns is reproduced a large part of a paper that Mr. R. B. Brown, the Engineer of the Milwaukee (Wis.) Gas Company, read at the annual meeting of the New England Gas Association. The author's object was to place before his auditors an account of the various systems of coal carbonization that now invite the consideration of gas engineers. In reading what Mr. Brown has to say, here and there one is forced to remember he is dealing with American conditions, and not with the conditions existing here. Particularly is this so in his treatment of intermittent vertical retorts; for no one would recognize his description of difficulties, losses, and working results as applying to the best-known intermittent vertical systems in use in this and neighbouring European countries. Judging from our own and our neighbours' experiences, our American friends appear to be a long way in the rear in the work they are doing with intermittent verticals—if Mr. Brown has made faithful representation of their experience. He states that, so far as he has been able to learn, the intermittent vertical installations, in their present type of construction, have developed several defects, some of which are inherent in the type, and others merely faulty design. Defects of this kind were surmounted during the period of development in the case of the intermittent verticals on this side, and are almost now forgotten. Then we are also told of the difficulties in the system of maintaining tight connections and tight retorts, and consequently of considerable loss of gas. There is also the hanging-up of charges; and fuel accounts are on the high scale. All we can say is that, if this is the best at the present date that our American friends have achieved with intermittent verticals, then they would save time and money by adopting the intermittent systems developed in Germany or in this country, instead of continuing to make such slow progress to a greater perfection. But has Mr. Brown properly represented the best American experience? Perhaps someone in America will answer the inquiry.

Activity in New York.

The report of the Consolidated Gas Company of New York for 1912, extracts from which are published in this issue, is of more than ordinary interest; and those who are looking about for new administrative ideas will possibly find advantage in reading how they do things in New York City. As here, the Company are suffering from increases in the costs of raw material; and they have also to meet very severe competition. But they succeed in making up more than is transferred from them in the way of lighting by developing utilization in other directions. The Company are carrying this development business to a very high point of efficiency. They have appointed a specially qualified head for the sales department, whose business it is, through his organization, to not only expand utilization on known lines, but to discover where fresh applications can be made, to keep himself fully posted in every new development, and to ascertain whether the Company's patrons, or any of them, can make use of it to mutual advantage. The education of the gas salesmen, of the meter inspectors, and, in fact, of those identified with all departments is a matter that is with the Company as much a factor in business development as any other feature of their procedure. The Company have five emergency automobiles always ready for action in connection with gas escapes and accidents; and they have adopted and placed at the public service four "Pulmotors," which are designed for the resuscitation of victims of asphyxiation from whatsoever cause. The details of the report will be found suggestive; and over it all is seen the Company's aim for the highest efficiency in all departments.

Stipulations in Contracts.

The fair wages clause in contracts given out by public authorities has now become well known; but it seems that it does not go far enough to meet the views of everybody. A case in point has occurred lately in connection with the Merthyr Board of Guardians; and it is well worth bearing in mind, as it serves to show that there is a point in regard to restrictive limitations beyond which it is not safe to go. The contract in question was a drapery one; and the Guardians inserted in the forms supplied to tenderers clauses insisting (1) upon the employment of trade unionists, and (2) upon payment to employees in coin of the realm—the last-named stipulation being made to prevent the work going to a firm who might have in operation the "living-in" system. These clauses appeared to the Government Auditor to constitute an undue discrimination between certain classes of tradesmen, the tendency of which was to limit competition. The result was that the lowest tender was not accepted; and the Auditor stated his intention of surcharging the Guardians to the extent of £52, which sum represented the difference between the successful tender and the lowest offer made. The Auditor called the Guardians before him, and explained his contention that such conditions as they had made were *ultra vires* and illegal, and that as trustees, or quasi-trustees, they must remove all grounds for suggesting that there had been unnecessary or extravagant expenditure. He added that the Guardians must not needlessly risk the assets of the Union, and there were strong reasons of public policy for holding that they had not the capacity of binding themselves by accepting contracts which contained provisions that were unreasonable or detrimental to the public welfare. The Clerk, while admitting that the Guardians had gone a step further than the fair wages clause, urged that the stipulations made were all perfectly legal; but the Auditor's determination to make a surcharge remained unshaken. Unless, or until, this decision is upset, the case may stand as a warning to others who may possibly be tempted to insert clauses of a like nature in contracts they may have to give out.

Labour in Municipal Government,

A conference has been held in Manchester of representatives of labour who have been elected to our local governing bodies. It is a good thing for labour to have a voice in the counsels of such bodies when those who represent direct their energies to the good of all, and not merely to the airing of the grievances of labour, and to the making of a sort of a demigod of its interests alone. But certain of the discussions on the occasion of the conference were lined too much by extremist ideas, and that is a danger of class representation in the local councils. Another danger is that, by their actions, labour members are prone to foment discord between workers and officials, and to undermine discipline. Several instances of this have come under our notice, in connection with gas workers; and were it not that labour representation (in the places in mind) is held in check by men of greater administrative ability, the lives of some municipal officers would be positively unbearable. One of the discussions on the occasion of the conference was opened by Mr. Sidney Webb—the subject being "Municipal Finance and Autonomy." Mr. Webb deprecated the making of profits from municipal trading undertakings, either at the expense of customers or employees; and, while there was a little criticism of this view, generally speaking there was approval. We are pleased to see this. The principle

of profit appropriation is altogether antagonistic to the civic management of services for the community; and when the subject is examined closely, there is no section of the community that should be more strongly opposed to the vicious system than the labour class. Take gas for example. There we have a service that has already, through the prepayment system, carried light, heat, cleanliness, comfort, and a saving of labour into some three-and-a-half million homes of artizans and other workmen in the United Kingdom; and where the gas undertakings are in the hands of local authorities, and all the obligations of the gas undertaking are met by the profits derived from the consumers, it is unfair to the poorer gas customers, just as it is to the others, that there should be a further profit made for the relief of the rates. If labour representatives on local governing bodies would look to matters of this kind, instead of building castles in the air and undermining discipline, they would be doing greater good than many are accomplishing at present.

And in Gas-Works.

There were other parts of Mr. Webb's paper that are worth notice. He is of opinion that the natural dislike evinced by ratepayers to having their burdens increased is what most hinders municipal progress. But many of the victims will doubtless be inclined to think that some local governing bodies are going ahead quite fast enough. It was in considering the possibility of securing possible relief for some existing burdens that the author made the remarks already referred to, and which are reproduced in another part of this issue. Agreement may be expressed with his general conclusion that, while it is fair to have a balance on the right side in each case, local authorities ought not to look to this source for any substantial relief of the rates. But this attitude cannot be adopted with regard to all that he had to say. It is, of course, the "duty of every public authority to take care that all the conditions of employment of all their wage-earners are such as not only to permit of, but also actively to promote, a decently civilized life, before they take a penny of the so-called profits of their enterprises in relief of the ratepayers." Where Mr. Webb is wrong is in confining the remark to public authorities. It is the duty also of companies—a fact which is generally recognized in the gas industry. One of the statements made by the author was to the effect that nothing whatever seems to have been done with the object of making the Manchester gas worker into a Manchester citizen, and that this individual appears to be "provided with no more of the conditions of civilized life than the gas worker under the ordinary capitalist company." It would be enlightening to Mr. Webb to hear the candid opinions both of the employees at Manchester and of those of the many co-partnership and other generously minded gas companies with regard to his assertions. The Chairman of the Manchester Corporation Gas Committee has already put the matter right so far as his own city is concerned; and the "ordinary capitalist companies" may rest perfectly content to leave their case to be judged by those who are conversant with all the circumstances. It is unnecessary to say more with respect to this portion of the paper, which was evidently written under a misconception of the facts.

PERSONAL.

Mr. A. M. Taylor, formerly of the Hereford Gas-Works, has just been appointed Outdoor Superintendent of the Stretford Gas Company.

Mr. W. E. Barnett, the Manager of the Carrickmacross (co. Monaghan) Gas-Works, has been appointed Manager of the works of the Westport (co. Mayo) Gas Company.

Mr. W. H. Day has been appointed Secretary to the Rochester, Chatham, and Gillingham Gas Company. He entered the Company's service as junior clerk as far back as 1866, and was made chief clerk in 1897.

Mr. J. Exton Holt, of Stalybridge, has been selected by the Gas Committee of the Ilkeston Corporation to fill the vacancy in the managership of the gas-works created by the resignation of Mr. F. C. Humphrys.

Mr. E. B. Martin, the Borough and Water Engineer of Rotherham, has been transferred from the class of associate member of the Institution of Civil Engineers to that of member; and Mr. E. H. Pike, of the Batchworth (Rickmansworth) Water-Works, has been elected an associate member.

ELECTRICITY SUPPLY MEMORANDA.

Besides the discussion in London on Messrs. Pearce and Ratcliff's paper dealing with the Manchester street-lighting experiments, there have been discussions at meetings of the Manchester and Birmingham Sections of the Institution of Electrical Engineers. In them, ample are the indications that electrical engineers are not prepared to accept without some reserve all that the authors of the papers put before them as representing actuality, though several spoke with a marked bias for electric lighting, and as though they entertained the opinion that gas men were unexampled for mendacity. We are, however, generous enough to think this is merely an idea on their part that has circulated from man to man, rather than a personally substantiated view. For example, there is Mr. R. A. Chattock, the City Electrical Engineer of Birmingham. He stated, as one report says, that "the figures in the paper as to candle power corroborated the *general impression* among electrical engineers as to the inaccuracy of the claims made by the gas people. It was well known that electric lamps gave their full rated candle-power." Mr. Chattock could not have read the paper properly, nor the preceding reports of the experts, or he would have discovered that the high-pressure gas-lamps in Manchester were not installed as they should have been, and would have been if the responsibility had been centred in one quarter, and that the electric arc lamps as supplied to Mr. Pearce did not give their full rated power as represented by the makers. It is fair to ask Mr. Chattock to say plainly whether his statement applies to the claims made for the high-pressure gas-lamps in Birmingham. If the Gas Department of Birmingham are deceiving the Council and the ratepayers, then it is Mr. Chattock's duty to say so, and not for him to play about with "general impressions." Mud-throwing of this kind is not a clean game.

Manchester Street-Lighting Experiment.

A Few Views.

In the course of the Manchester discussion, Dr. Rosenberg had something to say about glare. He does not believe in sending thousands of candle power into the eyes of the people in the streets, with the result that one can see the lamps, but not the motor-cars. He alleged that of the two systems of lighting—high-pressure gas and flame arc—the one is as bad as the other in the matter of glare. Dr. Rosenberg must know that this is not so, if he has considered the area of light-giving surface at the source in relation to the candle power. Nor can it be truthfully asserted by anyone who has seen the high-pressure gas-lighting in London—in Regent Street, Piccadilly, Whitehall, Victoria Street, and elsewhere—that the streets are not well-lighted, and the illumination a protection to the pedestrian against the fast-moving traffic. Mr. A. A. Koppel said he thinks the electric flame arc lamps in Portland Street are much too brilliant; and he does not agree with yellow flame arcs being used for street lighting. He prefers large metallic filament lamp units, except for narrow thoroughfares, unless the buildings are whitewashed. Whitewashing the buildings of Manchester, and keeping them white, would be rather an expensive luxury, solely for the purpose of giving to the Electricity Department a larger share of the street lighting. As a specimen of the exaggeration found here and there during the discussion, we may quote Alderman Walker. He asserted that a gas journal had stated that "dense darkness would exist during fogs where arc lamps were fitted." We do not know of a gas journal that has said anything of the kind. What has been declared is, and this has been confirmed by more eminent authorities than Alderman Walker, that gas-lights have a greater penetrating power in fogs than electric lights. The Alderman also expressed the view that the lighting in Portland Street was "infinitely better" than that in Princess Street. This statement is not endorsed by the experts, nor by our own observations. There were during the discussions criticisms of Mr. Pearce's low cost figures; but that is a very delicate matter for the Electricity Department.

"A Slight Increase."

Some of our friends in the camp of the enemy are queer sticks; and certain of them are queerer than the others. "Meteor" of the "Electrical Times" may be so classified. He writes a stupid little paragraph under the heading of "The Dilemma of our Competitors," but he forgets to say what the dilemma is. It is one of his idiosyncrasies to forget, and to refuse to tackle, inconvenient things. We have had more than one instance of this; the latest being the question of the useful heat imparted by a modern gas-fire. He has altogether ignored our last comment upon what he had to say anent this matter. The present paragraph about the "dilemma" (whatever that may be) opens with the question, "Are our keen competitors, the gas people, thoroughly satisfied with the State of Denmark?" We do not see anything for dissatisfaction; but this we do know that the electricity supply industry is not "thoroughly satisfied" with its own state. No great amount of searching is required to discover substantial evidence of this. "Year by year," proceeds "Meteor," "they [gas people] have hitherto [a redundant word that] pointed to a *slight* increase in the sale of gas." The gas industry hopes to continue the same slight increases. The newly issued Board of Trade returns show that, for statutory undertakings

alone, the last "slight" increase was 6,212,621,000 cubic feet—that was, for a twelvemonth—and that increase was 1000 millions in excess of the increase for the preceding twelve months. The total figures can be obtained from last week's "JOURNAL;" and before another twelve months are over a larger increase still will be officially reported for 1912. Another "slight" increase was in the receipts for the year covered by the returns—£1,042,594, which, of course, is a mere bagatelle to "Meteor."

Fairplay. The matter that has rankled "Meteor" into making a few indiscreet and hasty remarks is that we did not find new substance in the fat cooking and heating number of the "Electrical Times" (in the preparation of which he had part) to justify us in applauding him and his colleagues. That was the fault of electric cooking and heating—not ours. Then he says that the "gas journals" agreed to treat the issue with "silent contempt;" following this statement up by, in his wrath, showing that we did not treat the issue with silent contempt, but gave "three unhappy columns" to it, which columns are full of "ill-tempered *argumentum ad hominem*." It is not a safe thing to accept the judgment of an angry man; and so we hope that other electrical engineers besides those whom we know are subscribers to the "JOURNAL" will take his advice and read those "unhappy columns" for themselves, as "Meteor" declines to tackle them just as he did the note with the side heading "Pretender, or Unbeliever?" that appeared in the "Memoranda" on March 11. While that number is in hand, electrical engineers might also read the article on the lighting of the Slough workhouse (p. 660). They will find something there that "Meteor" has not yet thought fit to give his readers as a corrective of the statements made in a paragraph for which he was responsible in the "Electrical Times" for the 13th ult. If the readers can spare a little more time, they might turn back to the actual figures reproduced from the books of the Croydon Gas Company as to church lighting in Croydon, which figures and other information "Meteor" has not thought fit to publish, to show his readers the other side of a picture that he presented, at the instance, we gather, of Mr. A. C. Cramb, the Corporation Electrical Engineer of Croydon. There is also information regarding the Peckham tragedy which, through our columns, is in the possession of "Meteor," but has been absolutely neglected because it does not suit his purpose to acknowledge it. He may have something more to say about *argumentum ad hominem*. We were brought up in a school where fairplay (called "cricket") was held to be of capital importance in the code of honour.

The Kapp that does not Fit. Though we may expect it, we do not always get accuracy from the occupants of professorial chairs. Professor Gisbert Kapp has interested us more than once; and we admire his scientific attainments. We do not know, however, that he has any particular qualifications as a prophet; and we find that he suffers from the common human failing of being occasionally inaccurate. It was after a recent dinner of the Birmingham Section of the Institution of Electrical Engineers that he allowed those present to judge of the flexibility of his tongue. One report credits him with saying that there are more than a million gas-cookers at work. That is rather a loose statement, if correctly reported, for a Professor to make. It omits the factor of area. If it applies to the United Kingdom, it is an error. In the United Kingdom, there are more than three million gas-cookers in use; and the number increases year by year. The second error was that "food electrically cooked was turned out far better." Professor Kapp did not state the grounds for his adoption of this platitude that had birth on the electric cooker platform. A professor, who has a fondness for scientific accuracy ought to know better than to make such a statement without mentioning the grounds for his belief. In his book on "Electricity," Professor Kapp says that "the conception that physical action can take place without the intervention of physical causes is repugnant to the human mind." We agree with him in this; and so we hope that it will be repugnant to his mind to deny to us information as to the physical causes that result in the physical action which gives the user of the electric-cooker food better cooked than to the user of a gas-oven. No platitudes for answer please; let the ascribed causes be scientifically sound. The same report from which we have already quoted attributes to the Professor the remark that we are going to see an enormous boom in electric cooking. "Gas would have to give way, as it had done in the case of power." Another version is that "gas had given way in most cases for lighting and power." We are not responsible for these variations in the renderings of the statement. But neither in lighting nor power has gas "given way." The Professor cannot have kept himself *au courant* with the achievements of gas lighting, and with the displacements of electric lamps by the modern gas-lamps. Gas-engine manufacturing firms are year by year turning out more engines than ever. Some of these engines are being driven by town gas for the generation of electricity for the supply of large establishments, at a lower cost than that at which central stations can profitably supply.

Muddled. A private member of the Birmingham City Council, as our columns recently showed, suggested to the civic body the amalgamation of the Gas and Electricity Departments; and the proposal was defeated. Two such undertakings as the Gas and Electricity Departments of Birmingham (the former of which carries the burden of something like £100,000 a year of the expenses of the city) are immense enough to be run separately. The writer of the leaders in the Commercial Section of the "Electrician" seems to have got hold of the idea that the proposal for amalgamation came from the Gas Committee. He says that "it seems to us [the "Electrician"] that scare is at the root of this strange proposal of the Gas Committee; for what other motive have they, at back of their flimsy reasons, for the amalgamation? We imagine they have got a good hold of the idea of buying-off their enemy before he becomes too powerful for them, or some other bad attack of fright must have seized them." Imagination and flimsy ideas are concentrated in these passages. Sir Hallewell Rogers, the Chairman of the Gas Committee, was one of the strongest opponents of the proposal, and refused to have the work of the Electricity Department lumbering-up the work of his Department. Whatever put the absurd idea into the head of the "Electrician" writer, we really cannot conceive. Incidentally it is also observed by the same unstatesmanlike writer: "We think that a lot of useless competition would be avoided in future if an understanding is [were?] arrived at between the electricity and gas departments of municipalities on the subject of their respective spheres of utility—say, the former to do the lighting, cooking, and power business, and the latter heating and water boiling." Thanks! We have not sufficient time to inquire as to the state of any mind that can suggest that gas and electricity undertakings have the right to limit the free choice of the public as to the means of satisfying their requirements in any one of the lines of utility mentioned. "Meteor" ought to take severely to task the writer of the suggestion for hinting that the gas industry should be left as much as the heating and water-boiling branches, or even any loose end of usefulness. It must be acknowledged, however, that before the ink was dry that gave to the electrical world the profound ideas quoted, the writer withdrew a little by saying that "at the present time the two undertakings can very well remain absolutely independent." So think many others, save in those places where there is economy, and therefore public advantage, in running the two concerns under one administration, and so giving the electricity undertaking a robust foster parent.

Price Increases. At various times notice has been taken of those electricity concerns that have found out from bitter experience that price successes in one district will not necessarily be successful in another supply area. With the huge price variations that exist in a single area in the case of electricity supply, the levels of those prices for various purposes depend for their individual success upon local circumstances; and no undertaking can say, without reference to local conditions, that because a certain price for a particular purpose in another area is successful, that the price will be successful in its own case. It is a good thing for the electrical industry generally that those people and those electrical papers that clamour for 0·5d. per unit for cooking and heating, and a fraction of a penny per unit for power, do not lead all electrical engineers blindly to those low prices. To undertakings that have found reason to somewhat retrace their steps have to be added Lowestoft, Pembroke, and Rathmines. The Lowestoft Electricity Department was proposing recently to supply energy for cooking at 1d. per unit—a lower price than is charged there for any other purpose. Immediately upon this, we learn that the price for lighting is to go up to 5d. per unit, and for power to 2d. per unit up to a consumption of 2000 units per quarter, and 1½d. per unit above that consumption. The charge for the hire of outside shop-fittings is also to be raised to 2s. per fitting per quarter. At Pembroke, the electricity consumers have been informed that prices are to be raised by 5 per cent.; and at Rathmines, by 2½ per cent. These later increases are not large; but they are significant as showing the narrow margin between a profit-making and a profitless state, and are necessary to save the ratepayers generally from having to provide part of the cost of supplying those ratepayers who are consumers—a process which is in force in several towns, and which converts ratepayers from free men to the slaves of municipal trading in electricity supply.

Publicity Literature. We have pleasure in announcing, and in giving a free advertisement to the fact, that the Electricity Supply Publicity Committee have about 30,000 old-stock leaflets which they are willing to dispose of at three-quarters of their original price—price, not value. Samples of these have already come under our observation and criticism, and we cannot recommend further purchases. After a great deal of exertion, too, the Committee have produced what they call a new folder on the subject of electric cooking. It consists of six pages, two of which are blank. On the front page, there are the words "Cooking by Wire." The "wire" most people associate with unreliability. It is also stated that there is "no smoke, no smell, no fumes." We defy anyone to properly cook without the usual accompaniment of cooking smells and fumes. We have visited several electrical cooking demonstrations; and where there has been any serious cooking going on, there have been cooking smells and fumes. In the first picture inside the folder—"A Quick Breakfast"—a lady is depicted patiently waiting for her breakfast, and looking as happy as possible under the circumstances. She appears to be sitting at a

table on which is an electric heater, with the switches on the side opposite to the waiting lady. This does not seem to be right; nor is it right to illustrate steam issuing from a pot in sufficient volume to play sad havoc with the lady's beautiful *coiffure*. The next picture is entitled "A Perfect Dinner." The cook wears an imbecile expression; the cooker is altogether out of the square; and the switches are on the side of the oven, where they are exposed to the troubles produced by heat, water, and grease. They should be pictured fixed on to a switchboard attached to the wall, with the words accompanying the picture: "More expensive; but an absolute necessity." The next picture is headed "A Dainty Tea." Shown is a crowded table, with a heater and a kettle on it; the heater having a flexible connection that does not improve the appearance of the table. The visitor looks amused; the hostess is sitting as though in a straight jacket, with her arms bare and the straight jacket cut low at the neck. People have different ideas —thank goodness—as to the form that their advertisements should take. Judging from the criticisms from electrical sources that have been passed on the productions of the Electricity Publicity Committee, a good many people are not enamoured of their work in this line. By the way, we were told not long since that Mr. A. C. Cramb had resigned the position of Vice-Chairman of the Committee. His name still appears in that capacity on the latest of the circular-letters addressed by the Committee to central station engineers. It is not our business; but Mr. Cramb should ensure that no misconception arose, by compelling the removal of the name.

SULPHURIC ACID MANUFACTURE.*

THE new English edition of Dr. Lunge's standard work on "Sulphuric Acid," which is now before us, consists of a volume of three parts, each bound separately. The three parts comprise 1577 pages of text and many plates. We are not now concerned with the other volumes of the complete work.

The magnitude of the industry with which Dr. Lunge's work deals may be realized from the fact that reliable estimates place the world's production of sulphuric acid at the present time at the equivalent of more than 5 million tons of the concentrated acid. The United Kingdom is responsible for about a quarter of the world's production. The gas manager's direct interest in this prodigious industry is mainly that it absorbs as a raw material the spent oxide from his purifiers, and that it furnishes the acid which he requires for the manufacture of sulphate of ammonia. It may be useful to him if we refer to Dr. Lunge's treatise specially in regard to these two matters.

Spent oxide is mentioned first as a material from which sulphur itself may be extracted; and various proposals for the extraction are referred to. Few of these have ever met with any measure of commercial success. Then spent oxide is mentioned as a material which may be burned in place of brimstone or pyrites for the manufacture of sulphuric acid by the ordinary lead chamber process. There is very little information of value to English gas managers in the scanty treatment which Dr. Lunge gives to this portion of his chapter on the "Raw Materials of Sulphuric Acid Manufacture." For instance, such few figures as he furnishes for the quantity of sulphur available in the form of spent oxide from gas-works are quite out of date. On the other hand, there is good statistical information on the supplies of nitrate of soda, which is referred to as a raw material of nitric acid manufacture. Later there is a brief reference to burners for spent oxide, and illustrations are given of Hill's shelf burner, and Cowen's fire-clay retort burners.

There is little more in the whole work specially referring to the use of spent oxide for the manufacture of sulphuric acid. While it may be truly argued that the use of spent oxide does not involve any great departure from the methods in use with other raw materials, we think nevertheless that the author has not given it treatment commensurate with its importance in this country. His information concerning it is drawn chiefly from Continental sources, and valuable figures and statements by English authorities are ignored. Having regard to the fact that much more sulphur is extracted by means of oxide in this than in any other country, the author should have drawn mainly on English sources for information regarding spent oxide and its use for the manufacture of sulphuric acid.

Passing on to ammonium sulphate, the author apparently has not found it possible to state the consumption of sulphuric acid in its manufacture apart from the consumption in the manufacture of fertilizers generally.

So far as the general treatment of his subject is concerned, Dr. Lunge naturally is the most exhaustive and trustworthy guide available. In the present volume will be found a good deal of hitherto unpublished information on the "contact" process for the manufacture of sulphuric acid. This process has been carried on more or less secretly for many years past in a number of large works; and patent literature is of little value as a guide to what is really being done by it. Occasionally, evidence given in connection with litigation on "contact" process patents has lifted the veil. The fresh information now given by Dr. Lunge will, however, be welcomed by technical men.

* "The Manufacture of Sulphuric Acid and Alkali, with the Collateral Branches." A Theoretical and Practical Treatise by George Lunge, Ph.D., Professor Emeritus in the Federal Technical High School, Zürich; Honorary and Foreign Member of the Chemical Society, London, and of the American Chemical Society, &c. Fourth Edition, Vol. I. (in Three Parts), Sulphuric Acid. London: Gurney and Jackson; 1913.

THE NEW PURIFIER HOUSE AT THE TURIN GAS-WORKS.

THE NEW PURIFIER HOUSE AT THE TURIN GAS-WORKS.

WITH the recent completion, and starting in work, of a third purifier house and plant, the Società Anonima Consumatori Gas-Luce, of Turin, have brought to a successful termination the works of extension and improvement that have been gradually going on for some few years past.

Our illustration of the new purifier house shows it to be quite a worthy addition to the many previous buildings of these attractive Italian gas-works, which have been illustrated in the "JOURNAL" from time to time.

The sales of gas by the Company continue to increase; but the enhanced price of coal has rendered it necessary to raise the selling price of gas by 5 c. the cubic metre. In all other respects, the prosperity of the Company continues as marked and satisfactory as usual.

SEMI-INDIRECT LIGHTING BY INVERTED GAS-BURNERS.

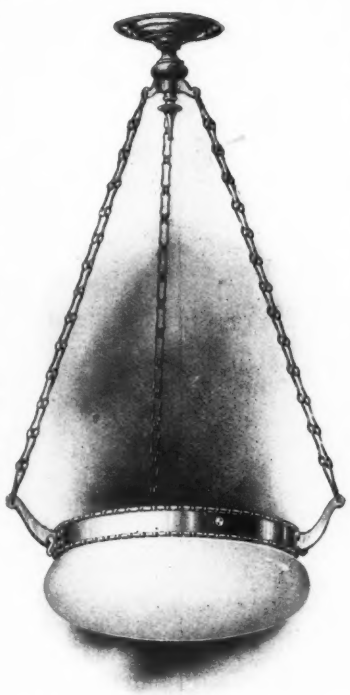
Illustrated by Messrs. William Sugg and Co.'s Productions.

THERE is no question to-day that we are on the brink of a revolution in our interior artificial lighting methods for those positions where a refinement of illumination is required, and where the highest hygienic form of illumination is demanded. People have been educated up to a higher degree of illumination than formerly; and they adopt the latest that gas-lighting or electrical improvement can offer. But with experience of the higher power sources of light, there has come the knowledge that there is eyesight deterioration—far more, owing to the higher intrinsic brilliancy, and the inferior spectrum quality of the light, by metallic filament lamps than by the latest forms of low-pressure incandescent gas-light. It is easy to counteract any ill-effects with either system of lighting by the use of forms of globes that completely obscure the sources of light; but there is considerable loss of light—varying according to the density of the obscuration, or the tint of the glassware used. The electric light, under the most advantageous circumstances, is, in comparison with gas-light (with gas at a reasonable price), for equal illumination an expensive form of light; and therefore it can ill-afford to have the metallic filament lamps enclosed in outer globes for the purpose of suppressing the maleficent effects of the lights. Consequently, a new system of eye-protection, and at the same time a diffusing system, had to be discovered for electric lamps. The plan of concealing the lamps in the cornices of a room was tried—reliance being entirely placed on reflection from the ceiling for the illumination. But the expensiveness of the system, and the patchiness of the lighting, were opposed to popularity. The next move was to what has become known as the indirect system of illumination, under which the lamps were fixed above suspended opaque dishes, which threw the light on to the ceiling, and this in turn reflected it into the room. There, again, the effect was not pleasing; and the number of lights required to realize a proper illumination, so that ordinary occupations could be carried on in a room with eye comfort, has not allowed the system to rise very high in popular estimation. Something between that and the ordinary system of illumination by direct rays from the source of light was therefore required; and so the opaque dish was changed to one that is translucent, or only slightly obscured, so that light can be diffused through the dish, and by reflection from the ceiling. There we have the semi-indirect form of lighting; and it is right that credit should be given to the electricians for having been the first to develop its use in this particular manner to any fairly considerable extent, although not the first to apply large shallow dishes or basins beneath lights. Theirs was the greater need.

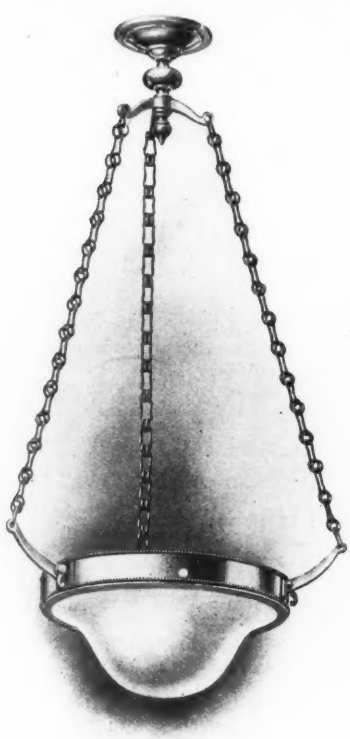
But what is the result? There is no question that the semi-indirect system is an advance in the science of illumination; and there is refinement and decorative effect in it. It is something new, too; and though somewhat more expensive in the matter of equipment and running cost, it is growing in popularity. There seems to be a greater disposition now in some quarters to spend more on illumination equipment than formerly. And it can be said in regard to running expense, that the semi-indirect system of lighting is more economical than any indirect system, or any complete obscuration of the source of light by frosted or tinted globes. In other words, by it the amount of illumination is greater for a given expenditure than by a system where the source is completely enclosed in a globe that screens the source of light from the eyes. This is easily appreciated, as, through the glass dish of frosted or cut or tinted glass, we have the down rays of light penetrating; and this is supplemented by the reflected light from the ceiling and from the tops of the walls of the room, which light reaches those surfaces from the source direct. In this way, though there is some loss of light in the lower part of the room compared with direct lighting, the loss is not proportional to that which occurs when the source is wholly obscured by a globe.

In the adoption of this semi-indirect system, gas need be in no wise behind its electrical competitor. The inverted gas-burner and semi-indirect fittings are adaptable with the greatest freedom, and with the same decorative effect, with a better quality of light. In point of fact, as, by the inverted gas-burner, a greater amount of light can be obtained per hour for a given expenditure of money, the semi-indirect system, using such sources of light, can be applied with greater economy than by using metallic filament lamps as the light sources. That is an important consideration in pushing this system of indoor lighting in competition with the semi-indirect systems of our electric competitors.

We illustrate to-day some of the fittings that Messrs. William Sugg and Co., Limited,

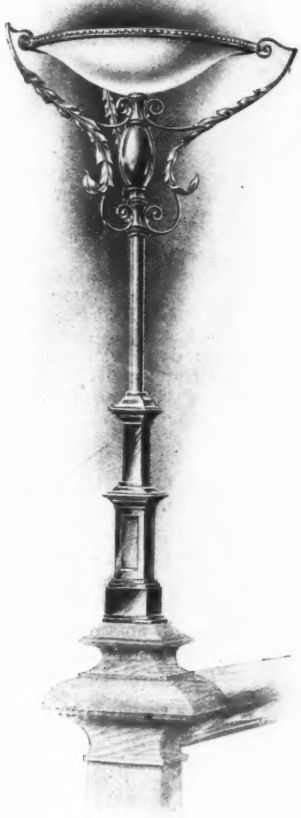


Gas-Fitting for Semi-Indirect Lighting.



Gas-Fitting for Semi-Indirec Lighting

Adaptor for Converting Ordinary Gas-Fitting to Semi-Indirect Lighting.



Pedestal Fitting for Semi-Indirect Lighting

have produced for the purpose of supplying the demand which has arisen for this semi-indirect system. We cannot describe nor illustrate all the variations of fittings which they have already designed for this purpose. But there is a good range of them—varied from one to three or four or more burners as desired; varied in the size and shape of dishes; varied in the matter of the glass dish or bowl being wholly obscured or rendered more decorative by being cut; and varied, too, by the character and decoration of the metal part of the suspension. Take their No. 1764 fitting—like one of the handsome designs shown. The ornamental band which carries the obscured glass dish has projecting arms upon it and suspension from the ceiling connection by the arms is made by three massive chains. There is no end to the variation that the system lends itself to in the matter of style; and it is a complete departure from the old type of pendant fittings. The chain suspension allows the fitting freedom just the same as an electric light fitting; and the chains can be made to any specified length. The gas supply to the burners is conducted down a flexible metallic tube passed through the links of one of the chains; and therefore not obtruding itself upon the eyes. In one of the other chains, a similar tube conveys the supply of gas for the pilot light. There is not the slightest strain upon the tubes, as the chains carry the whole weight of the fitting. The third chain can be utilized for the accommodation of any automatic lighting arrangement. The glass bowl in this particular fitting is about 18 inches in diameter; and as the brass band projects beyond this, and the chain connecting arms still farther out, it can be easily pictured that the fitting is something to be desired where novelty, decorativeness, and semi-indirect lighting are required. Attention to the burners and to the dusting of the dish is not a difficult matter. By the aid of a light pair of steps, inspection was made of the burners in this fitting. They are carried on three arms attached to the side of the dish supporting band. Each burner is fitted with gas and air regulators; and the part incorporating these is easily removable for cleaning. Glass protectors round the mantles are unnecessary; so that there is a saving here. It is no use speaking of gas consumption and candle power with these lights. The burners unless otherwise specified are made to consume 4 cubic feet of gas each per hour; but the illumination afforded depends upon the two factors of the character of dish chosen and the reflecting power of the ceiling and walls, together with the character of the pictures or other decoration on the walls. We make a departure in this form of lighting from candle power of the source to illumination service rendered, though, of course, the latter, under any given set of conditions, has some relation to the candle power of the source.

All consumers, however, cannot be expected to abandon their present fittings for new ones, in order to adopt the semi-indirect system; and so to provide a cheap form of conversion from the direct to the semi-indirect system has been another successful aim of Messrs. Sugg and Co. They have brought out a form of adapter, whereby an ordinary fitting can be converted to the newer system of lighting. Clips are provided for attachment to the down-tube of an ordinary fitting; and from this chains provide suspension for the necessary band supporter and glass dish or bowl. It is a neat and decorative means of changing an old fitting to a new form, and the direct system of lighting to the semi-indirect method.

A pedestal light at the foot of stairs, in halls, or in such situations as desks in offices and banks can be converted to the semi-indirect gas system by simple means, and with one, two, or three inverted burners. There is, in fact, no limit to application. We illustrate a very pretty form of converted pedestal light.

Another type of fitting for a centrepiece from which a large amount of illumination is required, provides a mixture of semi-indirect and direct illumination, by having the central body of light on the former system, and from the band supporting the glass dish, a number of small inverted burners giving direct illumination. This is a very effective fitting for a large interior.

It is unnecessary to say more. Scientific illumination is the order of the day. The gas industry has a good quality and economical light; and it has to be up-to-date in meeting the demands of the times. It is up-to-date—thanks largely to our gas-fittings manufacturers.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

A very well attended meeting of the London and Southern District Junior Gas Association was held last Friday evening at he Westminster Technical Institute, Vincent Square, S.W.; and the members were rewarded for turning up in such satisfactory numbers, as the proceedings throughout were of an interesting character. The chair was occupied by Mr. D. J. Winslow, of Lea Bridge, the President.

An Address by Mr. Thomas Goulden.

The President, after some formal business had been disposed of, remarked that they were that evening to enjoy the privilege of an address by Mr. Goulden, who was, he believed, one of their oldest patrons. It would be the first time they were accorded the pleasure of listening to him, but he trusted it would not be the last.

Mr. T. Goulden, the Chief Engineer of the Gaslight and Coke Company, then delivered his address (which will be found on p. 25), interpolating his written remarks with numerous references to personal experiences, &c., for the purpose of illustrating and emphasizing the various points made. In closing, he said, he thought it was well in these times, when so much attention had to be devoted to matters outside the works (the promotion of business, the superintendence of fittings in houses, and various other similar things), which tended to some extent to limit their time and to diminish their ability to think over the operations in the retort-house as they would like, that they should take such opportunities as they could of reviewing the ground-work of their success as gas companies—the conditions which existed inside the works.

The President remarked that he knew the members all appreciated the excellent address they had just heard. It was not always that an engineering address was delivered in so chatty a style. It would be a very valuable addition to the Association's "Transactions;" and they would be able to read it through a number of times, and so perhaps gain still more knowledge from it than they had done that evening. It was, of course, not customary to criticize addresses of this nature; but there were a number of patrons present, and the members would be delighted to hear some remarks from them in support of the resolution which he would now ask the Hon. Treasurer to propose.

Mr. E. G. Stewart proposed a hearty vote of thanks to Mr. Goulden—remarking on the indebtedness of the Association to him for his address.

Mr. W. Newton Booth, in seconding, said the address had been extremely comprehensive, and it was very kind of Mr. Goulden to devote a portion of his valuable time to imparting to the members the results of his own experience.

In support of the vote, short speeches [which will be found reported at the end of the address] were made by several of the patrons, and it was then carried with loud applause, and, as will be seen, acknowledged by Mr. Goulden.

A Presentation.

The President said they had a further item on the programme—and a very interesting one, too. This was a presentation to their President for last year, Mr. J. G. Clark. They would all remember that at the annual meeting of the Association last May it was proposed by Mr. Tooth, seconded by Mr. Liberty, and unanimously agreed, that a resolution acknowledging Mr. Clark's services should be framed and presented to him on quitting office. It was decided that the presentation should be made at this meeting; and, in the name of the members, he had great pleasure in handing the framed resolution to their late President. They were really greatly indebted to Mr. Clark, who was an exceptionally good President, and the Association highly appreciated his many fine qualities. He enjoyed the confidence of everybody, and was always ready to help anyone. The resolution was as follows:—

> That this Annual General Meeting of the London and Southern District Junior Gas Association desires to place on record its appreciation of Mr. J. G. Clark's untiring energy in conducting the affairs of the Association during the past year as President, with particular reference to his zeal in promoting the educational and scientific subjects connected with the gas industry, which have proved beneficial to, and highly appreciated by, the members.
>
> D. J. Winslow, President.
> E. Scears, Secretary.

Mr. Clark, who was cordially greeted, expressed his gratitude to the members for this proof of their appreciation of the little he had done during his year of office. It had been a pleasure to him; and, indeed, he always felt that helping and being helped were two of the most important things that went to rub off the sharp corners of this life. The Association provided excellent means for rendering and securing assistance. They included in the list of members, he believed, representatives of every department of the gas industry; and therefore there were at hand all the elements for solving any problems that might crop up, and a first-class medium through which they could help each other. The address they had listened to that evening furnished ample proof of the need for such an Association as theirs. The complexities of the manufacturing side of the business, and the necessity of being right bang up to date had been well brought to their notice. In accepting the handsome testimonial which the President had handed to him, he could only say that it would always be a pleasure to him to look at it and to recall the very large number of friends he had made during his year of office.

Gas Exhibition in Frankfort-on-Main.

Mention was made in the "Journal" for Feb. 18 of a proposal to hold a gas exhibition this year in Frankfort-on-Main. We learn from the last number of the "Journal für Gasbeleuchtung" that the exhibition is to be held from Aug. 23 to Sept. 7 in the large Agricultural Hall. The organization is to be undertaken jointly by the Frankfort Gas Company, the Zentrale für Gasverwertung [Gas Publicity Centre], and the German Association of Gas and Water-Works Officials, and an excellent show may be expected. There are to be morning and afternoon demonstrations of all domestic and industrial applications of gas, lectures on cooking, model kitchens, model rooms for all classes of houses, working gas irons, school-room lighting, shop-window lighting, &c. Any information about the exhibition can be obtained from the Manager, Herr Ingenieur Tormin, Berlin N.W. 40.

WATER HEATING BY GAS.

The "Victor" Complete Apparatus for Moderate-Size Property.

DAY by day it becomes more and more evident that the application of gas for domestic water heating supplies a large and promising field for business; but to get the utmost from this field, it is necessary to have types of boilers that can be adopted for service in the various classes of suitable property. The demand is growing for boilers applicable to the class of property that largely predominates in Suburbia; and those boilers must possess the two characteristics of cheapness and compactness. Mr. Thomas Potterton, of the Cavendish Works, Balham, S.W., has, owing to repeated inquiry, found it necessary to enter into this question of the provision of cheaper and compact boilers; and we have the results of his work pictorially displayed in the first four illustrations of a new series of "Victor" boilers, which, although not affording all the advantages of the original type of "Victor" complete automatic gas-heated hot-water apparatus, are equally efficient, and as suitable for many purposes.

A brief description of the new apparatus will suffice. The heater consists of a boiler fitted in the lower part of a cylinder in which an arch is provided to form the chamber for it. This is arranged in one piece of stout sheet metal—avoiding the necessity of joins or welds in the flue, where they would readily be attacked by the products of combustion. The boiler proper, like all the "Victor" boilers, is of cast iron; the arch-piece of steel, galvanized with the cylinder after being tested; while the flow and return pipes forming the connections are of galvanized steam-tube. This construction gives a substantial appliance throughout. A consideration in connection with maintenance is that all parts of the apparatus can be readily cleaned in position without any detachment or removal; manholes being fitted which give access to the interior of both boiler and cylinder. The flue chamber is also quite accessible by removing two screws holding the front cover-plate. The arrangement is illustrated by fig. 3.

The apparatus is being made in three standard sizes—viz., 20 gallons, 28 gallons, and 34 gallons capacity respectively. The smallest size measures 15 inches across by 42 inches high, and gives a reserve of 20 gallons, or sufficient for a good bath.

Strength and durability have been specially considered in this plant; a pressure equal to 45 feet head of water being adopted for general use, although a test-pressure equal to 100 feet head of water can be arranged by increasing the metal of the arch to ¼-inch plate, and constructing the shell of ⅜-inch plate.

There is a flexibility about the arrangement of the flue which enables it to meet the varying conditions under which it is necessary to fix the apparatus. The flue can pass up the centre of the cylinder where the apparatus can be fixed in a low position near the floor; or it can discharge through the front or back plate over the boiler for higher situations. Examples of this are shown in fig. 5. In the left-hand illustration, the flue-connection is made at the rear; while in the opposite view, the outlet is taken from the front of the boiler, to enable it to enter the chimney on the front of the breast, where the flue gathers the opposite way as so frequently occurs.

The apparatus, with varying detail, is shown by figs. 1 to 4. Fig. 1 represents the most simple form without the cut-out arrangement or thermostat control where low cost is essential. In cases where hot water is not in constant demand, and the

Fig. 1.

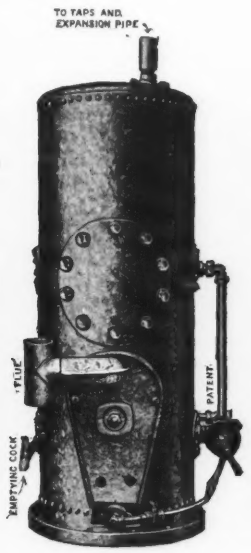


Fig. 2.

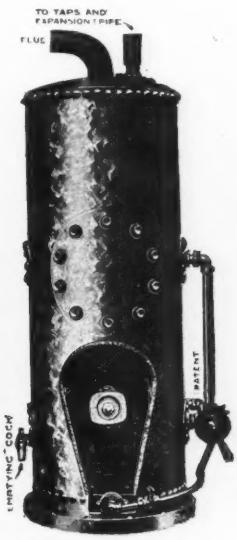


Fig. 3.

Fig. 4.

apparatus is only used intermittently, knowledge of gas consumption in relation to the hot water produced enables the economic use of the apparatus without automatic control, although the provision of the thermostat is advocated for all purposes when the outlay is permissible. Three views of the more complete apparatus are presented by figs. 2, 3, and 4. These show the cut-out valve arrangement for reducing the amount of water in circulation, so that a smaller quantity of hot water (sufficient for culinary purposes) is held in reserve when baths or other large requirements are not in demand.

The apparatus is complete in every way, having the necessary flanges for connecting to the service and cold-feed pipes, and fitted with gas-connection from the thermostat to the burner, which can be either of the luminous or atmospheric pattern. For use in conjunction with the kitchen range, additional flanges are fitted to the cylinder.

In action, the working effect of this new model of "Victor" apparatus is the same as the original types—producing water at a temperature suitable for use without circulating the contents of the storage more than once. This result is obtained by proportioning the size of the flow and return pipes in relation to the gas consumed, which is a special feature in gas-heated hot water supply introduced by the "Victor" system. Under test, the

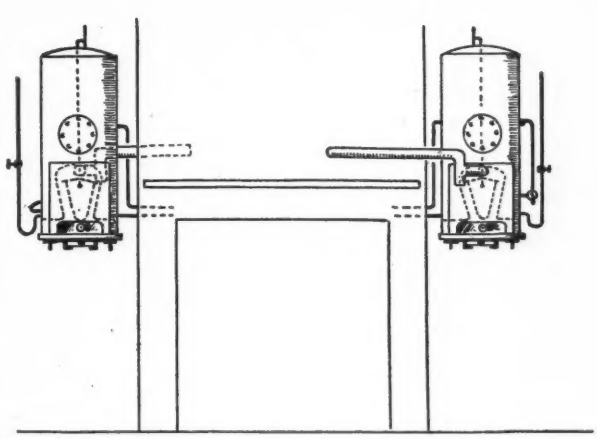


Fig. 5.—Sketch showing an Alternative Method for Connecting the Flue.

apparatus shows a good efficiency. The details of the appended test will doubtless be of interest.

Test of the New (No. 21) Apparatus—March 17, 1913.

Flow-pipe taken through flue.

Atmospheric temperature .. .. 41°
Water temperature.. .. .. 44°

		Flow.	Flue.	Gas.
Gas lighted—	6.30 ..	44° ..	— ..	—
	6.35 ..	94° ..	114° ..	3¼ c.f.
	6.40 ..	122° ..	145° ..	6½ „
	6.45 ..	133° ..	164° ..	9¾ „
	6.50 ..	139° ..	164° ..	13¼ „
	6.55 ..	142° ..	178° ..	16½ „
	7.0 ..	146° ..	182° ..	20 „

20 cubic feet of gas consumed.
20 gallons of water drawn off. Hottest water registered 131°; in bulk, 90° (460 B.Th.U. per cubic foot of gas).

Continuing—	7.10 ..	124° ..	170° ..	27 c.f.
	7.15 ..	— ..	176° ..	30¼ „
	7.20 ..	134° ..	180° ..	33½ „
	7.25 ..	138° ..	184° ..	36¾ „
	7.30 ..	142° ..	188° ..	40 „

20 gallons of water drawn off. Hottest water registered 133°; in bulk, 90° (460 B.Th.U. per cubic foot of gas).

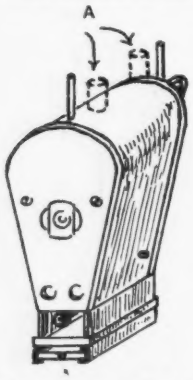
Continuing—	7.40 ..	120° ..	176° ..	47 c.f.
	7.45 ..	130° ..	178° ..	50 „
	7.50 ..	135° ..	182° ..	53¼ „
	7.55 ..	139° ..	186° ..	56¾ „
	8. 0 ..	142° ..	189° ..	60 „

20 gallons of water drawn off. Hottest water registered 133°; in bulk, 91° (470 B.Th.U. per cubic foot of gas).
5 cubic feet of gas consumed while drawing water.

Continuing—	8.15 ..	130° ..	180° ..	70¾ c.f.
	8.20 ..	136° ..	184° ..	73¾ „
	8.25 ..	140° ..	189° ..	77 „
	8.30 ..	143° ..	191° ..	80 „

20 gallons of water drawn off. Hottest water registered 133°; in bulk, 91° (470 B.Th.U. per cubic foot of gas).

This addition to the "Victor" system of gas-heated hot-water apparatus is considered an important adjunct, and will largely assist in meeting the varying demands for domestic hot-water supply.



The arrows at A show the alternative positions for the flue.

"Victor" Boiler, No. 24.

While dealing with the foregoing (No. 21) series of gas-heated boilers, we may for interest sake include a recent test of a "Victor" boiler (No. 24). In general use for household purposes, this works with a cylinder storage of 20 gallons. The accompanying illustration shows its general form, without particular description. The test was arranged for a 20-cubic feet gas consumption; water being drawn consecutively to ascertain the highest temperatures obtainable in small quantities for culinary purposes, and larger supplies as for baths. The piping consisted of 6 feet flow and 3 feet return to cylinder from the boiler, and 15 feet delivery-pipe from the cylinder to the measuring tank. The whole of the apparatus was uncovered.

Water temperature.. .. .. 46°
Room temperature .. .. 44°

		Flow.	Flue.	Gas.
Gas lighted—	8. 0 ..	46° ..	— ..	—
	8. 5 ..	59° ..	140° ..	½ c. f.
	8.10 ..	116° ..	173° ..	7 „
	8.15 ..	139° ..	180° ..	10½ „
	8.20 ..	142° ..	187° ..	14 „
	8.25 ..	147° ..	190° ..	17½ „
	8.28 ..	148° ..	192° ..	20 „

20 gallons of water drawn off. Hottest water 150°; in bulk, 91° (450 B.Th.U. per cubic foot of gas).

Continuing—	8.40 ..	137° ..	190° ..	28½ c. f.
	8.45 ..	145° ..	192° ..	32 „
	8.50 ..	147° ..	193° ..	35½ „
	8.55 ..	149° ..	195° ..	39 „
	8.56½ ..	150° ..	195° ..	40 „

20 gallons of water drawn off. Hottest water, 152°; in bulk, 91° (460 B.ThU. per cubic foot of gas).

Continuing—	9.10 ..	142° ..	193° ..	49½ c.f.
	9.15 ..	148° ..	195° ..	53 „
	9.20 ..	152° ..	195° ..	56½ „
	9.25 ..	152° ..	195° ..	60 „

20 gallons of water drawn off. Hottest water 156°; in bulk, 91° (460 B.Th U. per cubic foot of gas).

NOTE: The water in the cylinder at the commencement registered 46° for the first 20 gallons. This was replenished with water from the main for the second and third 20 gallons, which registered 45°.

It should be taken into consideration that the temperature readings shown do not include the heat losses occurring during the process of heating the water, or drawing it into a cold vessel, so that the total heat picked up by the boiler is in the region of 500 B.Th.U. per cubic foot of gas consumed.

The No. 30 boiler ["E" type] illustrated is one of a new series of "Victor" boilers designed upon the sectional principle, but in which there are only two water-ways—the centre section and the outer jacket; thus reducing the cost of production, which is the chief aim of introducing it. It has not, however, all the advantages of the earlier types, as the connections are set, and cannot therefore

be varied as in the case of the "D" series, to suit the low return connections requisite for horizontal apparatus. But the efficiency is quite up to the standard; so that, when the storage is above the boiler (as usually occurs), this boiler can be adopted. The boiler will be on view at the forthcoming Building Trades Exhibition, together with the new model of "Victor" complete apparatus.

NOTES ON EXHAUSTERS.

By "ALMEA."

OF all the apparatus made use of on gas-works, there is probably no portion which arouses less general interest than the exhauster; and it is, moreover, a rare occurrence for the subject of exhausting to be dealt with at the meetings of Gas Associations or in the Technical Press. It is not quite clear why exhausters should be treated with this apparent indifference. No doubt, it is partly due to the fact that the behaviour of the machine greatly depends upon the way in which the work is turned out by the maker; whereas, beyond proper lubrication, it requires little attention from the gas-works engineer. There are, however, certain points in the design and working of exhausters which, although chiefly of consequence to the constructor, should prove of some interest to those who are merely concerned with their running.

It is now a more or less recognized fact that any works making two million cubic feet of gas per annum or over can employ an exhauster to advantage. Such a small output only means, of course, a maximum make of about 400 cubic feet per hour. But exhausters suitable for the purpose are now frequently met with; and they are usually constructed with an outer drum diameter of about 6 inches. There is little advantage to be gained by fitting this type of machine with four blades, as the expense is materially added to, and, owing to the high speed of running, a very steady gauge can be maintained with the two. In order to reduce running costs to as low a level as possible, it is, perhaps, more economical in the smaller works to run the exhauster for a part of the time only—that is, during the first part of the charge when the maximum amount of gas is coming away.

The cost of power for driving is, of course, the chief consideration when employing exhausters in very small works, as a miniature gas-engine—consuming about 20 cubic feet of gas per hour—is generally used for the purpose. If the exhauster is running continuously, it will be seen that the engine consumes an amount of gas equal to 5 per cent. of the total capacity of the works. In this respect, it is interesting to note the remarks of Mr. W. R. Herring in his recent lecture at the Manchester University, when he stated that, in his opinion, it is cheaper to employ steam rather than gas power, owing to the fact that an abundance of low-grade fuel (requiring a forced draught for its combustion) can always be found on a gas-works.

Other advantages attending the use of the exhauster in small gas-works are those of driving liquor and other pumps by means of the same engine, and also the possibility of distributing the gas to the consumers at a greater pressure; the latter very often being one of the chief difficulties connected with small rural concerns.

RUNNING SPEED.

Some years ago, it was quite a common practice to drive the larger exhausters by means of belting; but the method is now fast giving way to the direct-coupled system. The chief objection to a belt-drive is, of course, the possibility of the belt slipping, in

which case the exhauster stops almost dead owing to the friction of the blades on the case.

It is not generally known that the speed to be taken into account when regulating an exhauster is not the actual number of revolutions performed by the drum per minute, but the peripheral speed of the tips of the blades. For a given number of revolutions per minute, the peripheral speeds of (say) a 6-inch drum and a 3-feet diameter exhauster would be widely differing, the blade tips travelling at a far greater linear speed in the latter case. In both cases, however, the speeds should be approximately equal. Thus, for exhausters of all sizes, there is very nearly a constant peripheral speed; and this should be about 700 feet per minute. In the case of a 12-inch exhauster, then, the number of revolutions per minute would be nearly 200; while the 3 feet machine should be travelling at about 70.

With regard to governing exhausters, the two-standard methods —firstly, that of using a bye-pass between the inlet and outlet, and, secondly, throttling the steam supply or electric current in accordance with the amount of gas coming over—are too well known to need description here. It must be borne in mind, however, that when a gas-engine is used for driving, the first method only can be adopted, as it is not practicable to vary the speed of the engine to any great extent by throttling. Schemes for doing so have certainly been proposed; but, at the most, the governing effect is only partial, and the most convenient arrangement is to work the engine in conjunction with a countershaft to which a stepped pulley is fitted.

Steam-Driven Exhausters.

On the larger and medium-sized works where an ample supply of steam is always at hand, by far the most common practice is to drive the exhausters by means of steam-engines. For this purpose, many devices and arrangements have been introduced with the object of ensuring efficiency and economy. In conjunction with the largest exhausters made—that is, those having a capacity of about 450,000 cubic feet per hour—it is always profitable to instal a compound engine, owing to the considerable saving in steam. Exhausters of this size are not, of course, frequently met with on gas-works, but their use is quite common on coke-oven recovery plants. In cases where a single cylinder engine is to be used, however, attention to the valve setting is necessary.

All exhauster engines may be run with a fairly early "cut-off;" and it is certainly unjustifiable extravagance to work with steam admission for the whole stroke. The most common practice is to arrange the cut-off at half-stroke, though many engines will be found working at three-quarters or seven-eighths. The latter custom is due to the fact that some engineers are of the opinion that an early cut-off is conducive to unsteady running; but with a flywheel of ample proportions, this should not be the case. In many instances exhausters are running with steam admission for only a quarter of the stroke, and there appears to be no undesirable effect on the steadiness of the "draw." When a cut-off is used, however, a rather larger engine is necessary; and for high-pressure steam, it is certainly advantageous to fit an expansion gear, such as the Meyer type, so that the earlier cut-off may be obtained. With very low-pressure steam, it is essential to work with admission during the whole stroke.

Lubrication.

The lubrication of exhausters has always been a vexed question, and it is now generally recognized that the use of a tar oil is indispensable to smooth running. For most purposes, the best lubricant is given by a mixture of refined creosote and mineral oil, composed of one part of the former to three of the latter. The temperature of the gas, the quantity of suspended tar, and whether the gas is clean or foul are, however, all important factors from the point of view of lubrication; and experience is, perhaps, the most reliable guide.

It will be recalled that Mr. Charles Carpenter, in a paper read before the Southern District Gas Association some years ago, explained that he was using an exhauster prior in sequence to the condensers, the working temperature of the exhauster being about 140° Fahr. In this case, not a drop of oil was found to be necessary; and the working parts, when the cover was removed, were perfectly free and clean except for a coating of very thin fluid tar. That the exhauster worked with a minimum of friction was confirmed by the readings of the inlet and outlet thermometers; the latter temperature being only slightly higher.

The system has evidently proved satisfactory; for the idea, although originating about fifteen years ago, is still in use at the South Metropolitan works. The main disadvantage, however, is that a greater exhauster capacity is necessary owing to the increased volume of the hot gas—the exhauster having to pass roughly 15 per cent. more gas at the higher temperature.

Precautions against Stoppage.

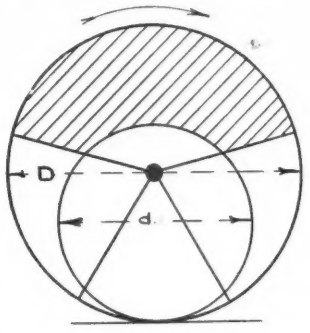
Owing to the seizing of a bearing or some other unlooked-for cause, an exhauster is liable to pull-up at short notice. This, of course, should not happen if the machine is properly attended to; but, nevertheless, it is an emergency which has to be provided against. In addition to duplicate plant, some means must be supplied for guarding against the undue pressure which would otherwise be thrown upon the retorts and the apparatus between them and the exhauster. A usual way is to insert in a bye-pass pipe a safety flap, which is kept closed by the outlet pressure on the exhauster; but a simple and safe means employed in comparatively few cases is that of inserting a safety seal in the main leading from the retort-house to the exhauster. This seal can be regulated to some definite depth—usually about 6 to 8 inches—and thus only a small pressure will be thrown upon the apparatus before the gas blows away. In cases such as this, it is unreasonable to expect that no gas whatever need be lost, and it is far better for it to be blown away at some prearranged point, where there is no likelihood of its becoming ignited. In making use of a seal of this description, care must, of course, be taken to see that the blow-off pipe is sealed to a greater depth than the highest possible "draw" at this point; otherwise air will be sucked in.

Calculation of Capacity.

Although the calculation of the capacity of an exhauster is a problem connected with the maker rather than the user, it is, nevertheless, a point with which the latter should be capable of dealing, should the occasion arise. Moreover, the figure is not arrived at as easily as is very often supposed; and the solution has invariably proved perplexing to students at examinations.

Considering an ordinary four-blade exhauster, it must be borne in mind that the capacity of the machine is not the whole space swept out by each blade per revolution. The amount of gas carried forward by each pair of blades is the greatest volume which exists at any time between the two blades.

Thus, referring to the illustration, it can be seen that at each revolution a volume of gas having a cross-sectional area equal to the shaded portion of the figure is carried forward by each pair of blades; and in one revolution of the exhauster this volume is



taken in and delivered four times. With a two or three bladed machine, the volume is, of course, greater; but then it is only displaced two or three times in the one revolution, instead of four times.

Suppose the following to be the dimensions of an exhauster:—

Inside diameter of outer drum	"D" feet
Outside diameter of inner drum	"*d*" "
Length of drums	"L" "
Speed per minute	"N" revolutions

Then the quantity of gas, in cubic feet per hour, which will be passed by a four-blade exhauster is given approximately by the formula—

$$Q = 65\ D^2 L\ N$$

The formula must, of course, be modified for two or three blade machines. With the former type, there would be roughly a reduction of nearly 10 per cent. of the quantity given by the above, and with the two-blade type the reduction would amount to about 30 per cent. of this quantity.

In calculating the capacity of an exhauster some proportional loss must always be allowed for "slip;" and it is very usual to put this down at a maximum of 20 per cent. The capacity of modern exhausters has to a certain extent been increased by the introduction of relief-port passages, which enable the blades to continue "drawing" for a longer period and provide a greater area for the issuing gas.

More Vertical Retorts for Sydney, N.S.W.

We learn from Messrs. William Coward and Co., Limited, the Agents in London for the Australian Gas Company of Sydney, that they have received instructions from the Company to accept the proposal of West's Gas Improvement Company, Limited, for a further large installation of Glover-West vertical retorts, capable of producing approximately 6 million cubic feet of gas per 24 hours. This addition—together with the plant already erected, and that contracted for last autumn—will ultimately give an approximate total output of 9½ million cubic feet of gas per 24 hours upon the vertical retort system. We also learn that the Glover-West vertical retorts erected at Newcastle (N.S.W.) were put into operation during the early part of February last and are working satisfactorily.

Mr. J. W. Mackay, of the Shanghai Gas Company, Limited, will shortly be coming home on leave of absence—temporarily residing at No. 14, Redston Road, Hornsey, N.

Though so much attention has lately been given in France to the utilization of naphthalene for internal combustion engines, it has been pointed out that it is at present available only in limited quantities; the total production in that country being about 14,000 tons a year.

SPIRAL-GUIDED GASHOLDERS: A WARNING.

By William Gadd, C.E., F.R.M.S.

The report of Mr. A. G. Drury, M.Inst.C.E., upon the Board of Trade inquiry into the causes of the disaster to the Ilkeston gasholder, forms a very salutary and highly necessary caution regarding the growing habit, unpardonable where true, of cutting down strengths for competitive purposes, in the construction of steel tanks when such are employed *above* ground for carrying gasholders of all kinds, but more particularly with columnless holders spirally guided.

Taken as a whole, Mr. Drury's conclusions will have the support and concurrence of all impartial and independent engineers who have made gasholder construction a study. There are a few points, however, which he has left somewhat in abeyance—no doubt for some good reason, but which it will be advantageous to completely elucidate. The present article has this end in view, as well as to emphasize the warning Mr. Drury has so carefully and sincerely delivered,

In an article by the present writer, which appeared in the "Journal" for Feb. 6, 1912, the causes of the Ilkeston disaster, by a process of exhaustion, were deduced to be practically the same as those arrived at by Mr. Drury after careful and prolonged investigation, and hearing all the evidence, and having the expert opinions on the subject fully placed before him. Taken generally, he comes to the conclusion that the design of the tank was faulty in form, and that the material of the plates, particularly where the rent took place, was too weak; also that the weakness of the plates was further augmented by the rivet holes being all punched, while the microscopical examination [likewise suggested in the article referred to] made by Mr. Stanger reveals, by means of his photographs, the special weakness due to brittleness and other causes.

The precise manner in which the rent came about he leaves somewhat an open question; but the writer considers there is little obscurity in connection with this part of the subject. Given one or more weak plates, from whatever cause, and the margin of strength somewhat low for the mere static pressure of the water, it would not require a very heavy wind pressure, if in the right direction, to produce a slight deformation of the circle, at the resisting points on the top of the tank. This, at first, would not be sufficient to cause a jam at the rollers, as a certain amount of play is allowed to provide for expansion and contraction. Such would permit of the holder working reasonably well for a certain time. Later, another moderate wind would make the deformation greater; and the process would go on increasing this, until eventually an actual arrestation would take place, sufficient to release the upper lift, which, on falling, would produce a shock great enough to tear the plates asunder along the line of greatest weakness.

On the point of the possibility of a spirally-guided holder jamming by accidental stones or other missiles getting into the spaces between the rollers and rails, it may be conceded to be just possible theoretically. But it is exceedingly improbable in practice; and evidences of the fact would be left behind. It may be well, however, in this connection to name the fact that, by the use of the inventor's latest patented invention, jamming by such an accident, or even by criminal intention, is rendered practically impossible.

The difference of opinion, reported between Mr. Doig Gibb and Professor Adams, is slight, and may be accounted for by each looking at the matter from two equally true points of view. It may be granted that if the structure of the tank was weak, and some of the plates were brittle, these inherent faults would in any case be the *primary* cause of the disaster, from either point of view. They might conceivably eventuate in a rent of the plates directly, or in producing jamming as a *secondary* cause, with consequent disruption from the fall of the upper lift, as apparently favoured by Professor Adams, and endorsed by the present writer.

This brings us to the simple fact that if the tank had been formed below the level of the ground, this particular form of accident could not have occurred. But it is often necessary or desirable to employ steel tanks above ground; and as regards spirally-guided holders, it is quite immaterial which method is adopted, provided the tank be properly designed and of sufficient resistance to effectively meet the impact of the wind, in *addition* to what is required to overcome the static pressure of the water. This was advanced emphatically in the article alluded to, and is fully corroborated by Mr. Drury. All the same, the writer desires to bring this necessary condition prominently to the front, and to say that, if this essential condition is in the future neglected, there will most surely be further disasters, for which designers, manufacturers, and the powers that be will be held morally, if not legally, entirely responsible. Such disasters cannot be ascribed to the spiral system in any way, but are the result of abuse of the great advantages the system has given to the gas profession generally.

The Institution of Civil Engineers, at their meeting to-night (Tuesday), will have two papers under their consideration—the first, "The Yield of Various Catchment-Areas in Scotland," by Mr. W. C. Reid; the second, on the "Measurement of the Flow of the River Derwent," by Mr. Edward Sandeman, M.Inst.C.E.

POINTS IN THE SELECTION AND PURCHASE OF A STATION METER.

By F. R. Parsons.

When once installed and satisfactorily put into operation, there is probably no piece of apparatus connected with a gas-works which receives less care and attention than does a station meter. True, the principles involved therein, together with its simplicity of movements, its positive and consistent action, make it a piece of mechanism which in the ordinary way calls for a minimum amount of attention. The prevailing tendency, however, is to lose sight altogether of the fact that, beyond being an automatic recording instrument, a station meter is, first and foremost, a mechanically propelled machine, subject to the same laws as regards wear and tear, breakage, and breakdown as every other piece of mechanical apparatus.

This, of course, is, to a very great extent, due to its almost complete immunity from what we might term casual accidents—that is to say, accidents which in the case of ordinary machinery are liable to occur through causes brought about by fatigue of metals, the action of centrifugal force, pressures, strains and stresses, overloading, &c. Then, again, a great measure of it is undoubtedly due to the fact that all, or nearly all, of its movements are out of sight; the resultant step to being "out of mind" being then an obviously easy one. A moment's reflection, however, will convince the most sceptical that we cannot employ mechanical agencies and movements without mechanical deterioration, loss of vitality, and wear being present; and that the fact of the latter operating in the dark, as it were, in no sense mimimizes its importance, but rather accentuates it. For this reason, it is customary to bestow more than a passing thought and care to the selection of the various metals and their quality appertaining to a station meter; this being only equalled by the amount of skill and ingenuity displayed in so designing and constructing the internal movements as to eliminate as far as possible all chances of a breakdown which ordinary conditions of wear and tear impose upon them.

In this short article, the writer purposes reviewing a station meter in the light of a machine, based upon the foregoing conclusions, and, without going into its functions or treating upon its capabilities and services, will only touch upon those points which have a direct mechanical bearing upon the matter.

Shaft and Bearings.

Since the operation of a meter depends on what pressure is possessed by the incoming gas for its rotative power when distributed through the drum, it follows that an almost frictionless movement of the whole of its internal mechanism is an absolute *sine quâ non*. And, further, when it is considered that a drum of from 12 to 15 feet in diameter, carefully made, accurately balanced, and truly aligned, should absorb little more than 5-10ths of an inch pressure to actuate it, it will be perfectly obvious that little latitude is permissible in the way of tight bearings, non-alignment, or unequal distribution of rotative weight. This being the case, it is necessary that particular attention be brought to bear upon the methods employed, not only in supporting the various members of the drum so as to ensure rigidity of movement and an equal distribution of weight, but in the actual supports in which the whole revolves.

Probably no detail of a meter has, during the past few years, received more close attention, or has been made the subject of more experiments than this; for upon the successful running of a drum within its bearings depends, to a very great extent, the accurate running of a meter as a whole when considered in the light of a piece of mechanism. Varied and many have been the devices tried in seeking effectual accomplishment of this end; but as it is unnecessary here to recount whatever merits or demerits they possessed, it will doubtless suffice if mention is just made of two or three of the most notable.

One maker with whom the writer has been connected once introduced, by way of experiment, a system of roller-bearings for carrying the main shaft. The weight of the latter was supported, front and back, on the periphery of a cast-iron roller, itself running on a steel stud surrounded by steel rollers. Two guide-rollers, considerably smaller in diameter than the main roller, were located at the sides of the shaft, in order to centralize it and maintain its correct alignment. As will be imagined, this system, in theory, should leave nothing to be desired, either in point of efficiency or yet as constituting an almost frictionless bearing. But in practice it was found, after a few years' wear, and being subjected to the corrosive and chemical action of the various impurities contained in the water, by the inroads made by sediment and precipitation, that the rollers would not keep sufficiently clean to maintain absolute freedom of movement. As a consequence, they gradually pulled themselves up and refused to revolve with the shaft. Undue friction was thus set up, the shaft and rollers got cut and grooved, permitting the former to drop out of alignment, and so created a still further source of trouble in the outside gearing which actuates the index mechanism.

It should be stated, however, as a slight justification for this particular system, that experience shows that the same conditions might not strictly apply in all cases; since it is found in practice that where in some instances these factors, as enumerated, may

be present as a militating factor against efficient working, they may be either wholly or in part absent in others. This can be accounted for by quite natural causes—such as the prevailing conditions of working, whereby much or little of the impurities contained in the gas are eliminated before entering the meter, or else by the actual amount of impurities contained in the water. As an instance of this, the writer has himself seen a meter opened up and the drum exposed for the first time in thirty-five years; and when the latter was cleaned of its soft deposit, the metal presented an appearance quite equal to new—in fact, the covering of tin on the drum sheets bore as deep a polish as when first coated. But against this might be placed another instance where, corrosion having taken place owing to the presence of impurities in the water, it would be quite usual to find, when the scale is removed from the surface of the drum, deep patches of corrosion, and even oxidization, which had eaten perhaps half-way through the metal; and this in a drum which may not have been working more than a fifth of the former period.

Another system the writer once remembers seeing tried was to run the drum-shaft ends in cages fitted with phosphor-bronze rollers. This system, while possessing some undoubted advantages in overcoming friction, is not likely to meet with much favour among gas engineers, primarily owing to the fact that the principles of roller-bearings of any type are such as will not commend themselves to the rather severe conditions imposed upon them through being continually submerged in a liquid having such destructive potentialities.

The form of bearing almost generally adopted to-day in large station meters is a plain cylindrical bush of phosphor-bronze, or similar alloy; being so shaped that it will swivel in its matrix and so adapt itself to the alignment of the shaft—thus obviating any binding tendency. This type of bearing, if made with a wearing surface of from three to four diameters in length, and of good sound metal, is found in practice to be more efficient, more durable, and less liable to get out of order, and will wear longer without showing any appreciable sign of drop, than any other of the more complicated type. In connection with this particular form of bearing, it is worth noting that its undoubted merit is considerably enhanced by the fact that some makers of station meters make provision whereby these bushes can be readily withdrawn from the outside, either for purposes of examination or renewal, without having to remove a portion of the body of the meter in order to permit of access to the inside.

The Drum.

Having now dealt with the main bearings, we come to several more details of great importance to an engineer. As has been shown, the drum itself is one of the parts most susceptible to deterioration; the gravity of this being accentuated by the fact of such deterioration being usually of an insidious character. A mere external examination periodically undertaken for the purpose of detecting early signs of corrosion, will not suffice unless the interior members be included in the general survey. But to accomplish this is difficult, if not impossible, unless suitable provision is made in the body of the drum in the form of manholes provided with removable covers, and which will permit of comfortable access to each quarter. Engineers will be well advised to include this provision in their specification whenever possible; otherwise they have no means whatever of observing, much less correcting, the insidious advances of corrosion.

Examination Covers.

Another feature, frequently overlooked when specifying details of utility, is the provision of a removable cover or plate at the back of a meter, in order to facilitate periodical internal examinations. The writer has known cases where this feature having been omitted by the makers, the whole of the back, together with both inlet and outlet connections, has had to be taken down to permit of an internal examination being made. The same thing also applies to the roof plates. Two or more manholes, which are easily detachable, will sometimes permit of a trouble being located and rectified in far less time than it would take to remove the whole of the top sheets were such provision not made.

Lubrication.

Lubrication of the main-shaft bearings is another matter worth serious attention when considering the purchase of a meter, for unless adequate provision is made to guard against wear (inevitable in nearly every case), the perfect alignment of the drum, necessary to correct working, is quickly destroyed. Of necessity, forced lubrication must be resorted to, seeing that the journals are always totally submerged when the meter is working. Here, again, the need for this is, to a considerable extent, governed by the prevailing conditions previously alluded to. If there is little or no gritty deposit present in the water, the small particles of tar carried by the gas into the meter, and which have escaped all the other processes in its journey from the retorts, may be held—as, indeed, it is sometimes—to be sufficient to prevent any great wear of the shaft ends and bearings, without necessitating any auxiliary system of lubrication. This, however, in the writer's opinion, is leaving too much to chance to warrant the risk being taken. But where the reverse is the case, and it is known (perhaps from past experience) that trouble of this kind will be present, it is then essential that some method be adopted whereby efficient lubrication of the principal wearing surfaces from the exterior of the meter be ensured.

One of the best and simplest methods of effecting this is by means of suitable tubular connections passing through the front and back plates of the meter, connected internally with the journals, and terminating externally in a grease-cup, so made that, by screwing down the cover of the latter around a screwed body, the solid lubricant is forced through the tube and thus into the bearings. A few turns of the cap—say, once a week—should be sufficient to ensure thorough and complete lubrication to every part of the bearing, and so prevent the almost uncanny noises one can sometimes hear taking place within a meter not so provided and whose bearings are cutting. This fixture might be made so ornamental as not to detract anything from the general appearance of the meter front.

Index Mechanism.

The external movements of a meter—viz., stuffing-box, intermediate gearing, and index mechanism—should be so designed and attached to the front plate that a minimum amount of trouble and time be involved in its removal either for examination or repair. The weakest point, and the one requiring most attention, is the stuffing-box, as this, if ineffectively designed or made, gives endless trouble, owing to it not being capable of preserving a sound, water-tight joint. Nothing looks worse than to see a nicely marbled and varnished meter front spoilt by the continual dripping of water down it. Immunity from this may be secured by insisting that the stuffing-box shaft should be of ample size, and that both the bearing surfaces of the latter and the packing chamber are ample in length, so as to reduce the leverage induced by rotative pressure, which tends to unduly wear the shaft and prevent the keeping of a tight joint.

Also is it best to have the whole of these movements outside the front plate, and not (as in some cases) stowed away inside a well where they are difficult of access. The index and intermediate gearing should be so designed that whatever covers the mechanism can be easily removed independently of the former, the better to locate any trouble *in situ*. If a clock or tell-tale arrangement forms part of the index mechanism, all joints encasing these movements should be constructed as nearly air-tight as possible.

Testing for Mechanical Defects.

Apart from the need for a periodical test for registration purposes is the necessity for an occasional test, in conjunction with a standard test-meter, in order to show if there are any mechanical defects present in the drum. It might happen that this may be ascertained at one and the same time, since the nature of some mechanical defects are such that they might be revealed when conducting a test for registration only. The writer is acquainted with one case where a mechanical fault, the existence of which had not even been suspected, was discovered in the manner indicated. At one part of the revolution of the drum it was found during a test that a leak in the latter existed. Subsequent examination disclosed the fact that a split in the metal of the body of the drum had occurred—due, it was concluded, to a slight buckle in one of the plates, which, being alternately subjected to pressure and submergence, had caused a buckling movement with every revolution, until finally a crack had developed.

The result of a registration test will sometimes indicate that the drum shaft, or bearings, or both, have worn sufficiently to cause the drum to sink in its bearings, and so alter its position relative to the water-line. But this must not be conclusively inferred until absolute certainty exists as to the accuracy of the latter, as trouble in this respect is liable to arise through some defect in the water-level arrangement. In the case of a station meter where the end of the shaft can be seen by removing a cover (as referred to under the heading "Index Mechanism"), this particular trouble would need no registration test in order to demonstrate its existence—such trouble being readily apparent on sight.

Minor Details.

Among other details of a more minor character, yet in their way equally as important from a selection point of view, mention might be made of a detail in connection with the construction of a meter, and which is worth consideration. As is generally known, the outer case is usually constructed of cast-iron plates, having machined flanges, and bolted together. These joints are not always made with external flanges; consequently if a leak develops in any of them, it is often a matter of very great difficulty, not to speak of expense, in remedying it. In the writer's opinion, all joints susceptible to leakgae should never be other than external ones.

Enlarging upon this detail, it is also usual in the case of rectangular or square meters to cover these joints with ornamental pilasters. Now these are sometimes so fixed to the plates that their removal, in order to examine a defective joint, necessitates lowering the water in the meter, and so putting it out of action. This is a mistake. They should be so fixed, by means of studs tapped into the body plates, that, by the removal of their respective fastening nuts, the pilaster can be taken down without breaking the continuity of the meter's operations.

Sir Boverton Redwood has undertaken to settle the conditions of the competition in connection with the prize of 2000 guineas offered by the Society of Motor Manufacturers and Traders for a home-manufactured fuel to take the place of petrol.

MANCHESTER JUNIOR GAS ASSOCIATION.

Meeting at St. Helens.

About fifty members of the Manchester and District Junior Gas Association visited the St. Helens Gas-Works on Saturday afternoon, at the invitation of Mr. Samuel Glover, M.Inst.C.E., the Gas Engineer and Manager of the Corporation.

The party were met at the station by Mr. F. E. Ward, the Assistant Gas Engineer, and conducted to the new general offices and show-room of the Corporation in Warrington New Road, where they were received by Mr. Samuel Glover, who said it afforded him much pleasure to welcome the members on their second visit to St. Helens. When he received from their President (Mr. D. V. Hollingworth) the intimation that the members desired to renew their acquaintance with the town, he felt pleased to think they had something in St. Helens of interest to them. It was, of course, for the members to discover for themselves whether their expectations were justified. He suggested a slight rearrangement of the programme, inasmuch as he thought it would be better to proceed at once to the works, where both the old and the new vertical retort settings could be seen in operation, and, after that, to hear his son's paper, entitled "Some Experiences in the Construction and Working of Vertical Retorts," which would be read at the Town Hall. This course would obviate the breaking-up of the meeting into two sections. In their tour of the works, he hoped they would ask questions on anything and everything upon which they desired enlightenment.

The members afterwards spent about an hour in the works, accompanied by Mr. Glover, Mr. Ward, and several members of the staff.

At the conclusion of the inspection, the party repaired to the Town Hall, where the Mayor's Reception-Room had been placed at the disposal of the members.

The proceedings were presided over by Mr. W. L. Heald (Preston), a Vice-President of the Association, who said their tour of the St. Helens Gas-Works had enabled them to inspect not only the original vertical retort installation, but also the second. There was, to his mind, no doubt that vertical retorts had come to stay. There were probably many people who were still sceptical, and also a great many who were doubtful about their advantages from the economic standpoint, because of the prevailing high prices. This side of the question, however, had nothing to do with them that afternoon. Mr. Roland Glover, as most of them knew, was engaged with West's Gas Improvement Company, Limited, of Manchester, who were the erectors of the Glover-West retorts. They would doubtless hear from him a very interesting paper; and he (the speaker) hoped his remarks would include working costs and the expense of erection. There was no member of their Association who could speak with more authority than the author on the subject-matter of the paper.

Mr. Roland B. Glover then read his paper, entitled "Some Experiences in the Construction and Working of Vertical Retorts," which, with the remarks upon it, will be found on p. 29. He concluded by reading some particulars relating to Dr. Harold G. Colman's exhaustive tests of vertical retorts with Wigan (Arley Mine) and other gas coals, which have already appeared in the "Journal."

Tea at the Town Hall.

At the close of the meeting, Mr. and Mrs. Glover entertained between sixty and seventy of the members and friends at tea at the Town Hall; the President of the Association (Mr. D. V. Hollingworth), who had been delayed on his way to the meeting, forming one of the company.

After the repast,

Mr. J. M'Nicholl (Warrington) proposed a hearty vote of thanks to Mr. and Mrs. Glover for their hospitality. He said as long as he could remember, the name of Glover had been one to conjure with in the gas industry; but since the advent of the vertical retort, that name and reputation had undoubtedly been enhanced. He assured Mr. Glover that the members of the Junior Association very greatly appreciated his presence at their discussion, and the kindly interest he manifested in all their works. In the vote of thanks to their host and hostess, the speaker said he desired to include the Mayor of St. Helens (Councillor James Crookes), who was also Chairman of the Gas Committee, for placing rooms in the Town Hall at the disposal of the members. He also wished to thank Mr. Ward and his assistants at St. Helens for all they had done.

Mr. Barrett (Ramsbottom) seconded the motion, which was carried by acclamation.

Mr. Samuel Glover, in returning thanks, remarked that it was sometimes said that the junior members of the profession were engaged under happier and more advantageous circumstances than the present-day veterans—a category in which he supposed he must now include himself. Even if this were so (he did not say it was), it was an exceedingly healthy sign. As their abilities increased through knowledge acquired, so their sphere of usefulness would be enlarged and increased. There was still plenty to be done. All the service they could render in the future would be required at their hands, and he was very highly expectant that better and greater things would be done in the future than had been done in the past. There was no end to the things which could be sought after—and found. He assured them that the more he learned and found out, the more he was convinced that he had a deal more to learn and find out. Mrs. Glover and himself had been delighted to entertain the members, and hoped to do so again.

The Visit to Birchenwood.

The Hon. Secretary (Mr. Alsop) announced that the visit to the coke-oven works of their President, which was to have taken place early in the year, had been definitely fixed for Saturday, the 19th inst. Members of the Senior Association would also be present.

GERMAN ILLUMINATING ENGINEERING SOCIETY.

The "Journal für Gasbeleuchtung" for March 22, reports that this Society recently held its first annual meeting in the Physical Institute of the University of Berlin; this being at the same time the first general meeting of any kind held by the Society since its formation last November. There were present 105 members.

Herr Warburg opening the proceedings, spoke on behalf of the Provisional Committee. He mentioned the purposes for which the Society had been formed, among the chief being the co-operation of the various branches of industry which were interested in lighting matters, and the representation of German interests in international questions. One direction in which there was room for much improvement was in measurements such, for instance, as those of current, resistance, &c., and, as civilization brought the nations more and more into dealings with one another, the need for international units was constantly making itself felt. He was sure the Reichsanstalt [official laboratory] would interest itself in their work. In view of the talk at the present time of the formation of an International Commission on Illuminating Engineering, the Society would be the best means of selecting German delegates, if the scheme materialized. In conclusion, he spoke of the difficulties, which some thought insuperable, of thus uniting in one Society the various branches of the industry, which were, in the ordinary course of things, rivals in trade. But he himself was of opinion that these difficulties could be surmounted, and he urged all to lay aside the axe of strife, at any rate while acting as members of the Society, and to join together in furthering the great and common interests which it had at heart.

Herr Liebenthal, the Secretary, next presented the report and statement of accounts of the Provisional Committee, which thereupon resigned. It was then proposed by Herr Bunte that three special Sub-Committees should be elected, to deal respectively with units of light, methods of measurement, and nomenclature. He then read out the list, which he had compiled in conjunction with Herr Dettmar, of members proposed for the Committee and for the various offices. They were voted for *en bloc*, and elected unanimously as follows.

President.—Herr Warburg.
Vice-Presidents.—Herr Lummer, Herr Haber.
Secretaries.—Professor Liebenthal, Dr. Krüss.
Treasurer.—Herr Schaller.
Committee.—Dr. Strecker, Dr. von Oechelhaeuser, Dr. L. Weber, Professor Martens, Dr. Eitner, Dr. Wedding, Dr. Ubbelohde, Dr. Mohr, Dr. Krey, Dr. Frank, Herren Schmidt und Haensch (Optical Instruments), Herren Siemens und Halske (Electrical Measuring Instruments).
Nominated by the German Electrical Engineering Society.—Dr. Bloch, Dr. Monasch, Herr W. Meng, Dr. Norden, Dr. Ulbricht, Herr A. Utzinger.
Nominated by the German Gas and Water Engineers Association.—Dr. H. Bunte, Professor Drehschmidt, Dr. Fischer, Herr E. Körting, Dr. Lang, Dr. Max Mayer.

It was decided to hold the next annual meeting in the autumn of next year. The business closed with a vote of thanks to the retiring Committee. An interesting and instructive lecture was then delivered to the assembly, on "The Eye and Illuminating Technique," after which the general meeting broke up. A meeting of the Committee was called, which, after electing Herr Strecker as its Chairman, chose the members who were to form the three Sub-Committees referred to above.

The Scottish Junior Gas Association (Eastern District) will hold their annual general meeting next Saturday, in the Heriot-Watt College, Edinburgh. The business will consist of the consideration of the report of the Council and the balance-sheet, the election of office-bearers, the delivery by Mr. R. B. Chalmers of a lecture on the "Gas-Engine," and the discussion of the paper by Mr. John Ferguson, of Dundee, on "Every-Day Experiences in Gas Distribution," which was prepared for the last quarterly meeting—see "Journal" for Feb. 11, p. 397.

The Society of Engineers will hold an ordinary meeting next Monday, when a paper will be read on "The Status of Engineers and Engineering, with Special Reference to Consulting Engineers." This essay (by Mr. William Ransom, Assoc.M.Inst.C.E.) gained the second premium—the first not being awarded—in the Status Prize Competition last year, and deals with questions affecting engineers in their relations with clients, assistants, contractors, and the general public. The author also discusses the training of engineering pupils, the question of registration, and a variety of other matters affecting the remuneration and professional status of engineers.

MODERN CONDITIONS OF GAS-WORKS PRACTICE.

AN ADDRESS BY MR. T. GOULDEN,

Chief Engineer of the Gaslight and Coke Company.

[Delivered to the London and Southern District Junior Gas Association, March 28—see p. 18.]

I have been somewhat exercised since having the honour of being invited by your esteemed Secretary to address the members of the Association this evening, as to the choice of any particular channel in which our thoughts may be most usefully directed for the brief space of time allotted me in which to avail myself of your much valued invitation; and I may say at once that the choice of a subject has been, to say the least, one of considerable embarrassment to me. On looking back, during even only a short period of time, it appears to me that every one of the multifarious directions in which our daily task takes us has been so assiduously followed, and the ground to be covered so intelligently explained, that anything I could say to-night must perforce be in the nature of not only a twice, but a many times, told tale. I propose, therefore, to confine myself to a few thoughts as to differences arising out of modern conditions of gas-works practice as compared with those followed a few years back, and to make some remarks more particularly directed to those likely to be placed in charge of works, which occur to me as arising out of this comparison.

Changes in the Retort-House.

I should like first of all to draw your attention to the difference between gas-works practice as now followed, and to contrast it with that existent not so many years back, immediately prior to the introduction of machinery into the retort-house.

The main difference is, of course, that, whereas manual labour at the earlier period was to all intents and purposes universally employed (a crane being practically the only labour-saving appliance then used), the modern tendency is to employ mechanical agencies whenever they can be usefully and economically applied. This transition in method has been steadily going on for the last thirty years, commencing in the retort-house, where the West and Arrol-Foulis machines were the earliest of the really efficient mechanical stoking appliances installed. These were followed, in course of time, by that beautifully simple and ingenious charging appliance the De Brouwer machine, together with the mechanical link pusher-discharger, by which a 20-foot retort was emptied of its coke. Then by the Hunter-Barnett hydraulic retort pusher-discharger, and finally by the somewhat cumbrous, but exceedingly successful, Fiddes-Aldridge machine, by means of which, in one operation, a retort is simultaneously emptied of coke and charged with coal.

[Mr. Goulden here remarked that lately the Fiddes-Aldridge machine had been further improved, and he believed an arrangement was now being tried by which it was possible to fill the retort quite full of coal—a very great consideration.]

The inclined retort, introduced in the early nineties, which at one time bade fair to oust altogether the horizontal from the place it had so long occupied, although more strictly a physical than a mechanical labour-saving appliance, was another step in the reduction of manual labour, by the substitution of the action of gravity in the charging of retorts. The saving of labour in the emptying of the inclined retort is also considerable when the retorts are new, but in course of time a good deal of this advantage is lost.

One great advantage belonging to the inclined retort, however, gave great impetus to a new element of labour saving—namely, the mechanical handling of coke, the mechanical appliances for which are so much more economically applicable where the discharge is on one side of the retort-stack only, than in the case of the horizontal machine-stoked retort, which, up to the coming of the inclined retort, received its coal and delivered its coke at both ends of the retort. With the introduction of the De Brouwer machines, however, this disadvantage belonging to the horizontal retort was done away with; and now, with the Fiddes-Aldridge combined charging and discharging machine, the economy of working a horizontal retort-house of a size commensurate with the capacity of the machines being operated up to full power is exceedingly difficult to improve upon.

The most recent innovation is, of course, the vertical retort, in which the force of gravity is so utilized that the passage of the charge through it is effected without the application of any power outside of physical agency; and undoubtedly this method, which has come to stay, is the most complete contrast that can be conceived to the old laborious methods employed in retort-house work. This system has made much more rapid progress in Germany, where it was introduced, than in our own country—not so much owing to our engineers being slow to take up a new system, as to the fact of the Dessau retort tending to develop calorific rather than illuminating value in gas produced by its agency. As you are probably aware, for some time past it has been fully recognized in Germany that the real present-day criterion of the value of town's gas is its calorific value, and testing for illuminating power is practically a thing of the past. It is a fact that to-day, in many of the largest towns in Germany, the question of what is the illuminating power of gas distributed could only be answered after making a special experiment in order to determine what it may be. Other and excellent types of the vertical retort are, however, being extensively introduced here, and the immediate future will undoubtedly show a great development in this direction.

Carburetted Water Gas.

Though not properly belonging to the retort-house, but closely allied to it, we cannot pass through a review, however brief, of labour-saving agencies in gas manufacture without referring to carburetted water gas, which, in the simplicity and cleanliness of its operation, apart from its ingenious application of chemical reactions to practical work, is a most beautiful process to watch. Unfortunately, residual products, which in the case of coal come to our aid in reducing the cost of our raw material, are conspicuous only by their absence in this process, and when oil prices rule high, considerably handicap this mode of manufacture. One very great advantage, however, belongs to carburetted water gas—that is, of being produced in a gas-making plant which can be readily brought into action in case of need, making it a valuable stand-by arrangement, the possession of which may be secured at a much smaller prime cost than an equivalent productive power if furnished by coal gas.

Coal and Coke Handling Plant.

The effect upon the retort-house itself and its interior fittings of the employment of the various mechanical agencies referred to is naturally great. The erection of coal stores in elevated positions best calculated for automatically supplying coal to the stoking machinery, and to the feeding arrangements of inclined and vertical retorts, together with the erection of coal conveying and breaking appliances, has to an enormous extent increased the part of the constructional engineer in the interior of the retort-house; and this is now still further added to in new installations by the abolition of the old brick-built house, with its massive walls, in favour of thin walls and constructional steel work.

Passing from the retort-house to the yard, we see the same tendency to replace manual labour by mechanical means. Coke-conveyors bring our coke from the retorts and mechanically distribute it, broken and graded, into elevated storage bins, from which the buyer's sack, placed under a suitable spout, is filled by the mere pulling of a lever. In place of the conveyor, the electric telpher is being increasingly used; and, especially where the coke is deposited into heaps, it is a most suitable and economical appliance. The handling of coal has passed through the same transition—the "grab" having, especially for waterside work, to a very large extent displaced the "coalie" with his shovel.

The building of ferro-concrete storage for coal is also adding to the work of the constructional engineer, though not yet to such an extent here as in some parts of the Continent, where the rigorous climatic conditions of winter make it a necessity to carry very large stocks of coal.

Demands on the Engineer.

I have dealt somewhat at length with the extent to which mechanical appliances have superseded manual agency in our works, in order that we may rightly appreciate how much more the skill of the civil engineer is required from us in these days than was necessary to the quite successful gas manager of the past. Our works are now so full of costly and more or less intricate mechanical appliances, whether in retort-houses or the yard, and constructional work on a large scale is so much more needed, that it must be realized how increasingly incumbent it is on the manager in charge of works that he should be fully equipped with the knowledge of the engineer, and that he should not only be capable of efficiently conducting the processes of gas manufacture and purification inside his works, and its distribution outside, but that he should be equally at home in the design and construction of the buildings and plant that he uses. It is this point—the aspect of the gas manager as the civil engineer—that I would impress on your minds this evening.

I know those in charge of gas undertakings have great diversity of occupation; but the *fons et origo* of their work is in the quality of the engineer, and I cannot too strongly dwell upon the primary necessity of engineering ability as the basis on which to build success. I am not saying anything in detraction of the many reputable firms engaged in gas-works engineering when I tell you that, as the result of years of experience, I am more than ever convinced as to the advantage of issuing to contractors my own drawings and specifications of works of construction, rather than of inviting their propositions with respect to such works; and in following this method I am also fairly well convinced that contractors are with me in my opinion, since, in tendering, they are doing so on one identical set of drawings, showing them precisely the work which is to be done.

Apart from the derogation of one's own position, if I may use the term, it is in my opinion distinctly unfair to put a number of firms to considerable expense in preparing drawings, for the out-

lay on which only one is to be recouped; and, moreover, such a system is a standing temptation to so cut-down sections of constructional steel as to reduce the factor of safety in construction, which, owing to the corroding influences in the atmosphere of a gas-works, it is so necessary to preserve. Again, the collective fruitless expenses thus put on the competing firms must, in the long run, be borne by their clients, and thus expenses of construction are in the end increased. If, whatever the causes may be, it appears desirable to invite the preparation of drawings, I would much prefer to approach one reputable firm, and secure a price for the work to be done by negotiation, without resorting to competitive tendering. I need not point out the advantage in prices likely to be obtained by the fact that in tendering on detailed drawings the competing firms are able to more precisely make their estimates of cost, and thus reduce the margin allowed for unforeseen contingencies.

Necessary and Unnecessary Expenditure.

Supplementing the acquirement of engineering knowledge, I would add the necessity for a certain amount of self-effacement in the engineer. Engineering, and particularly the branch of engineering devoted to gas-works construction or reconstruction —and perhaps more particularly the latter—is possibly peculiar in this, that, given thorough efficiency and the capacity for resisting the effects of wear and tear, lowness of prime cost is essential as a criterion by which the work is to be judged; and I know no more important point which I myself have to continually take into consideration, in dealing with both the reconstruction of existing works and the construction of new, than of obtaining a satisfactory answer to the question, Will it pay? We all like to be, or at any rate like to believe that we are, in the very forefront of progress; and it is difficult at times to consent to continue working with plant which we know will strike the observer as being old-fashioned, or at any rate not possessing the style that we should prefer to attain to. Still, we know that to demolish what we have—old fashioned and perhaps less efficient than we should wish it to be—and to replace it with new, would involve expenditure not bringing its due return, and so perforce we must, at any rate temporarily, resign ourselves to be considered in some respects a little behind the times by those not so closely in touch with the details of our work as we are ourselves.

I would not for one moment suggest parsimony in outlay for works and plant which will bring its due return; but that the due return for expenditure is to be reasonably anticipated must be the *sine quâ non* of the expenditure being incurred. That this has not always been so, a very slight study of the capital sunk in gas undertakings will quickly show. I am, in so speaking, not forgetful that other conditions than merely that of building "not wisely, but too well" have had their share in the variations to be seen; but engineering has had its very considerable share as a contributing factor.

That the wise expenditure of a company's resources is a cardinal point making for success in the production of cheap gas cannot be too strongly impressed, not only on the mind of the junior engineer, but on that of every engineer connected with a gas undertaking; and this point is only too painfully realized by those whose predecessors have failed to properly appreciate the fact. One of the most useful studies which I can recommend is that of the heavy burden which a high capital account places on an undertaking; and I know of nothing more incumbent on any engineer, both with regard to his own reputation and as a duty he owes to those who may follow him, than that the expenditure of money for works should not be made without the most serious consideration of what is to be the return. The best paying gas-works may not be the most "showy," if I may use the term, but is those where it is apparent that plant has been installed most suitable to the extent of the productive power of the works in which it is situate, and with due regard to the fact that in some details a matter of a few years may render portions of the plant obsolete, or at any rate replaceable to advantage by improved appliances.

This is a progressive age, and no man is worth his salt who does not in every way strive to be thoroughly up-to-date in all his work. But unduly fine buildings and complicated machinery, however splendid from an academic point of view as engineering works, do not of necessity go to the production either of cheap gas or increased dividends. I have at this moment in my mind one glaring example of such a gas-works, not, I may say, in this country—a gas-works of the first magnitude, in which engineering science has run riot. Mechanical ingenuity in this case had seemingly exhausted itself in the appliances installed; and wherever the labour of even one man's hands could be replaced by mechanical means, there was complete disregard of the cost of installation. "It is magnificent, but it is not war." At any rate, it is evident the application of such methods of construction must be very far from being a paying proposition, and following on such lines simply means putting a burden on an undertaking that would constitute a handicap of the most serious nature.

I have recently looked up the files of the "Gas World" (which periodically publishes valuable statistics with regard to gas undertakings in the United Kingdom); and I find from that paper that during 1911 the capital charges, taking a few important undertakings supplying gas, varied between 4·79d. and 15·35d. per 1000 cubic feet sold. This is, of course, an extreme variation; but in a circle of only a few miles around Charing Cross, the same paper gives statistics of capital charges varying between 6·14d. and 12·69d. per 1000 cubic feet. It will be at once perceived what an important bearing these figures have on the price at which gas can be sold, since, other things being equal, in the last two cases a difference of (say) 6½d. per 1000 cubic feet would represent equally good working in the case of the respective engineers and staff of each of the two undertakings.

Our task is not to put up engineering monuments, but to supply light, heat, and a useful means of motive power to the community at the cheapest possible price consistent with a due return to the owners of the undertakings we serve for the capital they have invested. Unless we possess the technical knowledge that I advocate, we cannot ourselves build efficiently and at the same time economically, nor usefully consider the suggestions of contractors, but must either place ourselves in their hands altogether, or call in the services of the consulting engineer.

When we consider what a beneficial part we play in supplying the community with one of its greatest needs, I think we may claim for the business of gas supply that it is certainly one of the most important branches of civil engineering which is followed for the public benefit; and it is clearly our duty—both to ourselves and to the branch of the profession we have chosen to follow—to preserve and to enhance, by all means in our power, its status and our own in the engineering world.

Modernizing Existing Works.

With regard to the actual modernizing of existing works of long standing (a subject which was kindly suggested to me by your esteemed Honorary Secretary as one on which I might say a few words), my experience convinces me that it would be pure affectation to attempt to dogmatize in the smallest degree on this very difficult subject.

The bringing up to date of existing works, which is more or less centred in the problem of what to do with our retort-houses, is one that is so affected by local conditions that no rule, it appears to me, can possibly be laid down that would have anything like general application. Horizontal retorts operated by machinery are doing excellent work in many places, and—a most important factor to be borne in mind where manufacture is on a large scale —any coal that may be bought with advantage can be equally well carbonized; while the present ability of being able to work a 20-foot retort with machines applied from one side of the retort-stack only enables the horizontal retort to be worked at a very low cost for labour. At the same time, it must be recognized that, to get the best out of stoking machinery, it must be worked on a load-factor that bears at any rate considerable relation to the extent of its working capacity. The cost of upkeep is also considerable, though this item is now much reduced in the most modern machines.

The advantage of the inclined retort is that no skilled labour is required for its operation, and, the coal-handling machinery being all that is required, expenses of upkeep are small. It also stands upon a smaller ground space than the horizontal retort, and, when a house containing inclined retorts is worked at a small proportion of its total productive power, working expenses are less likely to increase relatively than is the case in the machine-worked horizontal retort house. A certain amount of selection in the description of coal that may be most advantageously carbonized is required, and my experience indicates that a somewhat shorter life may be reckoned on than with a well-set horizontal retort. The labour necessary in an inclined house is no less than in a machine house worked at full power—possibly a little more—but as compared with such a house worked on an inadequate load, it has the advantage in labour charges.

My experience with the vertical retort is limited, so that I hesitate rather to speak about it at all. I would confine myself to drawing your attention to the low labour charges involved in its operation, even when only small units are employed; and its working is, moreover, in the continuous type, so free from the nuisance of smoke as to permit of its being operated under the most stringent conditions as to cleanliness in the surrounding atmosphere. The vertical retort undoubtedly produces an improved tar, and, with regard to gas, tends rather to develop calorific value than illuminating power from the coal carbonized. The coke made, being quenched with steam rather than with water, is of excellent quality, and brighter in appearance than that made either in the horizontal or the inclined retort.

I have made previous reference to carburetted water-gas plant as an adjunct to the retort-house. We may fairly consider this as a modern institution, since it was not introduced on any extensive scale into this country until 1890, when the first installations were made with the view of replacing the use of cannel as an enriching agent. The facility with which this plant can be brought into action, together with the comparatively low cost of its erection, quickly caused its adoption for supplementing the coal-gas plant in periods of emergency, and in order to top-up the peak load of winter work. It is also valuable in many cases owing to the small relative area on which the generating plant stands. The labour needed in its operation is small.

The main disadvantage under which carburetted water-gas plant labours is the large proportion to the total cost of production that is borne by the raw material used; but, at the same time, I do not consider that any important works should be without its proportion of this plant. Its use as a consumer of coke, at times when stocks would otherwise tend to accumulate, is manifest; and in periods of short supplies of coal it is most valuable. It is, as a reserve plant, built and kept in readiness for work at a

much lower cost than coal-gas plant. How increasingly incumbent it is upon us to have a "second string to our bow" is best realized by a consideration of the many directions from which our supplies of coal have been recently threatened, and by the knowledge that in the future strikes are likely to come "like a bolt from the blue," with a complete absence of the forewarning which in the case of the last coal strike was of such inestimable value to us. Our statutory obligations as to supply are unconditional, and carburetted water gas, already proved a valuable auxiliary, is not likely to be of less value in the future.

Outside the retort-house I would only refer to the necessity of thorough condensation, in the presence of hydrocarbon vapours which will by simultaneous deposition take the naphthalene into solution as it is thrown down from the gas during the process of cooling. This, followed by the propulsion of an oil spray or vapour into the gas on the outlet of the works, is, I am convinced, the best solution of the naphthalene question.

The introduction of electricity into gas-works as a means of motive power is a matter that possesses considerable interest; and electrical power generated by the motive power of a gas-engine is a thing that I constantly use when reconstructing retort-house plant, in such mechanical arrangements as coke handling and conveying plant, and others of a like nature, where it is advantageous to distribute the application of power to several points scattered throughout (say) the retort house, or in different parts of the mechanical device being erected. The ability to thus distribute our application of power is, by the saving of complicated gearing and shafting and its future wear, more than a compensation for the losses experienced as between the source of power and its point of application—viz., in the electric generator, the cabling transmitting the current and the transmission motor. Where, however, the application of power is only needed at one point, the direct gas-engine drive is undoubtedly the best, without the intervention of electric transmission; and, moreover, the direct use of the gas-engine is an object-lesson which it is advisable by all means to inculcate on the casual visitor to our works.

The Obsolete System of Gas Testing.

As engineers who are likely to have the responsibilities of administering gas undertakings in the near future, I cannot refrain from asking your serious consideration to the futility of continuing the obsolete system of gas testing still followed, and impressing upon you the advisability of using every effort to ensure that it should, with as little delay as possible, be reconstituted on a rational basis. The official method of testing the value of gas by the direct determination of its illuminating power is about as useful as measuring the value of the modern rifleman by his ability in the use of the long bow. We do not require flame value. Calorific value is the measure of the value of gas to the public, and if testing must needs be continued, let calorific value be the test. In my own opinion, the competition which we have to meet, and so strenuously to combat, is quite enough to ensure that only what best suits our consumers will be offered to them.

The testing for flame value is a positive harm to the public, and only those whose lot it is to conduct gas undertakings under the conditions of testing in London can realize how harmful it is. A "low test" is returned, possibly at one testing-place out of several supplied with gas from the same source, all the remainder of which may show ample power, with the immediate result that the make per ton has to be reduced and serious extra expense incurred, in order that the chance of a second low test may be avoided. All this brings no benefit to the consumer, who, on the contrary, has to bear by far the larger proportion of the waste caused. Fortunately, we already have a precedent for the omission of flame-value testing, and it is profoundly to be desired that the time may be short before we are rid of this irksome and useless restriction on the efforts we are making in the manufacture and supply of cheap gas.

The Benefits of Co-Partnership.

One can hardly make any general reference to modern conditions of gas-works practice without the subject of co-partnership being introduced. I make no apology for speaking of this, except for so doing after I must already have put a severe tax on your patience. At this time it is difficult to realize why this beneficent influence, with which the name of Sir George Livesey will ever be honourably coupled, was not more fully extended at an earlier date than it has been. It is undoubtedly one of the best of modernizing influences introduced into gas undertakings, and I cannot too strongly urge its extension to those which have not yet taken it up. The transformation of the mere wage-earner into a proprietor, no matter in how small a degree, is one that must tend to develop the quality of personal interest of the workman in his work; and that it succeeds in its object is patent to all who have given co-partnership a serious trial. To me one of its best features is that, managed as such schemes are by committees in which are represented all ranks of an undertaking (directors, officers, and workmen), it makes for closer personal intercourse at frequently recurring intervals of time, when the exchange of views, and the consideration of proposals having in view the promotion of a common interest, make strongly for mutual regard and good fellowship—qualities which in times of stress are likely to be of inestimable value.

I am sure that, as the principles of co-partnership are more widely understood, and its practice more extensively adopted, it will prove of the greatest possible value, not only to gas men, but to the nation generally, in reconciling many interests which, while generally considered conflicting, are in reality identical.

SOME REMARKS ON THE ADDRESS.

The President (Mr. D. J. Winslow), after a vote of thanks to Mr. Goulden had been proposed and seconded, asked the patrons of the Association present to make a few remarks, and called first of all upon

Mr. F. W. Goodenough, who said he was very glad to have an opportunity of congratulating the members of the Association upon the privilege which they had enjoyed that evening, and which he had shared with them, of listening to Mr. Goulden's interesting address. He had told them that he had been embarrassed in the matter of the subject which he should select for his address; and it was quite obvious to them now that it was an embarrassment of riches. Mr. Goulden's store of knowledge and experience was so great that it was merely a question of what portion he should utilize. It was not a question of being gravelled for a subject. Something had been said by Mr. Goulden about having troubled his hearers with platitudes. But, of course, he was a master of his subject; and a man who was a master of his subject always regarded what he knew as platitudes. It did not, however, follow that his words were platitudes to those who listened. Mr. Goulden was quite right in his reference to the necessity for the maintenance of the status of the gas engineer as a civil engineer. It was a pleasure to hear him speak so strongly on the importance of the gas-works manager being his own engineer; and it struck him (the speaker) that this emphasized more than ever the necessity that had been arising of late years, and was becoming more and more recognized, for separating the engineering side of a gas undertaking from the business side. It was not possible, with the increasing complexity of the engineering side and the increasing complexity of the commercial side, for any one man to really run the whole of the business of a gas undertaking of any size; and it was becoming more and more generally admitted that specialists were wanted on both sides. He was connected with one side, and Mr. Goulden with the other; but, of course, in a way each was concerned with the other's side. The salesman was necessarily interested very much in the principle Mr. Goulden had laid down, of studying economy as the prime consideration, rather than erecting engineering monuments, because it was essential for the real success of the industry that gas should be produced at the lowest possible price, though at the same time it must be of the most suitable quality for the use of the public.

Mr. A. F. Browne said he felt sure it must have been most gratifying to the Council and to the members of the Association to have among them Mr. Goulden, and to listen to such a delightful and valuable address. When they reflected that he was the third Chief Engineer of a large London Gas Company to whom they had been privileged to listen within the short space of some two years, they must feel that a great deal had fallen to them. He was sure that all the words of wisdom they had heard on this and the other occasions would sink into good ground, and spring up and bear good fruit in the future. Now, the theme of the address that night, if he gathered rightly, was the influence upon modern gas-works practice of the supersession of manual labour by mechanical appliances; and Mr. Goulden's historical retrospect of the introduction of machinery into the retort-house and other portions of the works was admirable. With this portion of the address many, perhaps most, of those present were to a great extent familiar; but he went a step further, and opened up to the members of the Association a still wider prospect of fresh fields and pastures new in which in years to come they might find they were in a position to disport themselves. He had set before them high ideals from the point of view of the chief official on the technical side of the largest gas company in the world. They could not, of course, all be chief engineers, and perhaps for some of them it might be better if they did not find themselves in that position; but it was a privilege to listen to gentlemen who spoke from the plenitude of their experience and the growth of wisdom which they possessed through lapse of years and through having had to support great responsibilities, and to profit from the instruction they were able to give. He did not himself recall any occasion on which he had listened to an address of this kind with greater pleasure than he had experienced that evening. There was that about the address, if he might presume to say so, which made it clearly evident that the author was telling them that which he knew out of his own long, varied, and wide experience. When they considered the enormous size of the Company in which Mr. Goulden held the chief responsibility for the daily supply of light, heat, and power in the form of gas, it gave to his statements and opinions a value which could not easily be surpassed. He gave one the opinion of being a man who not only knew what he was speaking of, but who was not afraid to say what he thought. He thanked him for the address he had given, which they might all benefit from reading.

Mr. F. J. Bywater remarked that he considered himself fortunate in following Mr. Browne, because that gentleman said so ably just what he would like to have said himself. He, also, wished to congratulate the Association on the fact that they had been lucky enough in so short a period as a few months to receive such excellent addresses from the Chief Engineers of two of the London Gas Companies. It showed not only that they were very anxious to encourage the members in their work, but that they

recognized the good work they were already doing. He hoped it would not be taken as a remark out of place, but it was a common matter of comment among senior engineers that the work of the Junior Associations was at the present time excellent, and was shaping in a manner that was very pleasing indeed to them. It was a very happy thing that they should have had the privilege as an Association of meeting in one session such engineers as Mr. Doig Gibb and Mr. Goulden, and of listening to their experiences both of their own works and of the general aspects of the gas industry. He thought the keynote of Mr. Goulden's address was one which was very apt indeed—namely, "Does it pay?" It was very necessary nowadays that they should always consider this point when any work had got to be done. When one considered, as had been pointed out in the address, that the capital might be a question of 6d. per 1000 cubic feet difference on the cost of gas, it showed how very important it was that every engineer who had work to carry out should first of all ask himself, "Does it pay?" It seemed to him that in their work they would find "King's Treatise" was a *sine quâ non*. Turning to another matter—the education of the engineer—he was interested to hear a man of Mr. Goulden's wide experience give his views on this point, because he did feel very strongly that the contractor was forcing the engineer of the present day very much out of his true position. The engineers ought to take a proper share in the designing and carrying out of their work; and it was greatly to be deplored that contractors, through the lethargy of engineers, had been allowed to take the position in gas-works that they had. He did not wish to depreciate the work of the contractor; but anyone who knew a contractor's office was aware that many of the ideas which came out of that office were merely the ideas of draughtsmen who might have no actual experience. Many of the failures that had taken place in gas-works had been the result of adopting, without any discussion or without any investigation, the opinion of a draughtsman in the drawing office of a contractor. It behoved gas men to make themselves masters of any subject they might take in hand. They must take up first principles; and if they were going to be engineers, they must do engineers' work and thoroughly understand it.

Mr. T. S. Lacey said he would like to refer to one point in the address which had appealed to him, and which he thought would have appealed to all those present, and that was the necessity for self-effacement on the part of the engineer who was to do his duty to his employers. There was a very great temptation—perhaps an almost irresistible temptation—to one to look to his prestige and advancement by constructing works that would appeal not only to people who understood their saving value, but also from the point of view of their appearance. Thus there was often a great temptation to one to spend money possibly unnecessarily in making a job not only effective, but also having the appearance of being an engineering structure perhaps rather more valuable than it really might be. No doubt it would be very interesting to all the members if they had the opportunity that offered itself to those connected with his Company of being able to trace the development of machinery in such works as they had in their undertaking. He supposed that in the inside of the retort-houses at Beckton there was hardly a brick or mouthpiece left of the original structures which existed when Mr. Goulden and he (the speaker) were first there. If the old plant could be brought back there, they would not be able to recognize the inside of the retort-houses. The amount of work Mr. Goulden had constructed for their Company had been extremely large, and no history of what he had done had, he (Mr. Lacey) thought, been hitherto published. He was looking forward to the time when Mr. Goulden might find an opportunity to give some account of the work that had been carried out. It seemed to him that nothing would be of more general interest than some account of what had been done by the Gaslight and Coke Company in the way of modernizing their works. The best published results of Mr. Goulden's work that he knew of were the analyses, in which one could easily trace year by year the effect of his operations. Those who knew Mr. Goulden were aware that he found in these records the thing that he most appreciated. The fact would appeal to those present, as it appealed to all engineers, that the work he had done for his Company had been so effective in reducing the cost of manufacture and enabling them to lower the price and increase the sale of gas and to put the Company in a position that was so very much in advance of what it had been in years gone by. He thought Mr. Goulden had spoken, not only as an engineer of great experience, but also as a friend. They all recognized that what he had put forward in many cases as simple statements was really the result of experience, and that his opinions were opinions which had been arrived at after careful thought and a very great deal of labour. Personally, he had had much pleasure in hearing his old friend and his chief give the address. It was one of the occasions that would be memorable to him. Of the enormous amount of work that Mr. Goulden had, so quietly and so efficiently, done for their Company, he would look forward to hearing more—possibly in another place.

The President expressed the indebtedness of the members to Mr. Goulden for his address—pointing out that he had always taken great interest in the juniors.

The vote of thanks was then carried with applause.

Mr. Goulden, in response, assured those present that the work of preparing the address and delivering it had been a pure pleasure, and nothing else. It was a sort of literary ramble, which it had been very little trouble to prepare. But he must say that he had difficulty in adequately expressing his thanks to the various speakers for their remarks. He had known Mr. Browne a very great many years, and was convinced that he would not say a word he did not thoroughly mean. And as he had known Mr. Browne, so he had known Mr. Lacey for many years; and their association had never been anything else than a pleasure. Mr. Lacey had been good enough to attribute to him (Mr. Goulden) all the success they had had in reducing the cost of manufacture in his Company. But in reality all that he could do was to take the advice and consider the suggestions of the engineers who were responsible for the working of the plants which he devised and put in. Without the loyal aid of the station engineers, their Company could never have taken up the position that it occupied to-day. It was, in fact, due to Mr. Lacey and his colleagues far more than to his own efforts that the Company was in its present position in regard to manufacture. Mr. Goodenough had spoken of the separation of the technical side and the commercial side of large undertakings; and with this he quite agreed. The work of the gas engineer had become very complicated, and there were so many details to take into consideration. Things were far different from what they were (say) a little before the introduction of carburetted water gas. Then, it was a matter of routine; but look what it was now. Every big works, at any rate, was a bundle of machinery, and small things had to be considered to a far greater degree than was contemplated until a few years ago. At the same time, the salesmanship side was the complement to this. It was of no use to make gas cheap if it was not sold; and they knew the tremendous competition that those who sold gas had to meet. On the other hand, unless they made gas cheaply, however much they tried they could not sell it. The two sides must work together. He was quite sure that every member of the audience would do his best to maintain the prestige of the gas industry. It was a very important branch of civil engineering; but he did not think it had been sufficiently recognized. It really depended on the engineer whether it should take a higher place than it had hitherto been allowed to do.

Specification of Street Lighting.

A paper by Mr. A. P. Trotter, on the "Specification of Street Lighting," giving an account of the work of the Joint Committee of the Institution of Electrical Engineers, the Institution of Gas Engineers, the Institution of Municipal and County Engineers, and the Illuminating Engineering Society, will be presented at a meeting of the Illuminating Engineering Society at the Society of Arts rooms, John Street, Adelphi, on the 15th inst. The paper will not be read; but the discussion will be opened after some introductory remarks by the author. Members of the Institutions of Gas Engineers, Electrical Engineers, and Municipal and County Engineers are invited to attend and take part in the proceedings.

"Elland" Vertical Retorts for South Brisbane.

As the result of a visit recently made by Mr. W. S. Moore, the Engineer of the South Brisbane Gas-Works, for the purpose of studying at first hand the newer forms of carbonization in England, an order has been placed with Messrs. Robert Dempster and Sons, Limited, for an installation of "Elland" intermittent vertical retorts. The plant will consist of fifty-two retorts, each 13 ft. 6 in. long, arranged in two rows, and grouped in four settings of ten and two settings of six. The firm are certainly to be congratulated on the fact that two Colonial gas engineers, each making independent studies, have, within six months of each other, selected Dempster's "Elland" system as being most applicable to their particular conditions.

Masonic—Evening Star Lodge.

The installation meeting of the Evening Star Lodge, No. 1719, was held at the Freemasons' Hall, Great Queen Street, last Wednesday, when the retiring W.M. (W.Bro. C. W. Offord) installed his successor in the chair, Bro. William Edgar. Subsequently, the following officers were duly invested:

Senior Warden, W.Bro. E. G. Smithard.
Junior Warden, W.Bro. A. E. Croager.
Treasurer, W.Bro. Thomas Cash, P.M., L.R.
Secretary, W.Bro. Walter T. Dunn, P.M., L.R.
Senior Deacon, Bro. J. F. Wicks.
Junior Deacon, Bro. A. P. Main.
Inner Guard, W.Bro. Fred. J. West.
Director of Ceremonies, W.Bro. Cyril G. Davis, P.M.
Organist, Bro. J. F. Simmance.
Stewards, W.Bro. H. W. Packham, Bro. Samuel Carpenter, and Bro. Henry Kearns.

"A Thousand Uses for Gas."—That the number of uses to which gas can be put is considerable, every gas manager will readily acknowledge; but he would probably hesitate to assert that it exceeds a thousand. He may, however, safely do so on the authority of a pamphlet bearing the above title just issued by the American Commercial Gas Association, under the direction of their Committee on Publicity. It gives a list, alphabetically arranged and freely illustrated, of upwards of a thousand uses for gas as applied in the arts and trades. There is an index to the classification; and the whole is stitched in a stiff wrapper.

SOME EXPERIENCES IN THE CONSTRUCTION AND WORKING OF VERTICAL RETORTS.

By Roland B. Glover, of St. Helens.

[A Paper read before the Manchester and District Junior Gas Association at St. Helens last Saturday.]

When your President asked that the Association might visit St. Helens, in order to inspect the installation of vertical retorts in operation here, he coupled with the request one that I should read a paper on the subject, which request I am very pleased to fulfil.

The author was, early in his training, introduced to the process of destructive distillation of shales in continuous vertical retorts, and has been intimately associated with the development of the Glover-West system of continuous carbonization of gas coals. This system you have all had an opportunity of thoroughly inspecting to-day, and during your visit to the works have seen the first experimental setting which was constructed on the Glover-West system, and which is still giving excellent results after five winters' work—having been started in October, 1908. The bench has been let down on three occasions, when minor repairs have been made, and at such times it has been inspected by many eminent gas engineers, who were then able to see exactly the condition of the setting.

It is only necessary here to give a rough outline of the general system of the setting. The coal is elevated to a suitable height, and is then distributed to a line of bunkers by a push-plate conveyor. These bunkers hold forty-eight hours' supply of coal; so it is unnecessary to elevate coal during the week end. Directly beneath the coal-hoppers, and connected separately with each retort, is a coal measuring chamber fitted at the top with a gas-tight coal valve. This measuring chamber is directly above the retort proper; and there is no valve or mechanical feed between it and the retort. At the bottom of the retort is an extractor screw, by means of which the throughput of coal is regulated. This is driven through a pawl-and-ratchet motion by a reciprocating rope-drive, which passes along the whole length of the bench. The coke, after having been drawn from the retort, passes into a coke-receiving chamber, provided with a self-sealing door. This chamber is emptied every two hours.

The retorts are built up of twelve sections—a section to each floor or chamber. The two uppermost sections are situated in the waste-gas cooling chambers; the middle eight in the eight combustion chambers; and the bottom two in the secondary-air heating chambers. The bottom section is of cast iron, made with horizontal and vertical radiating fins, which give a large heating surface for the incoming secondary air with which to come into contact. The section above is also in the secondary-air heating chambers, and is built up of special blocks. The other ten sections are of moulded fire-clay; each section being provided with a collar near the top of the section on which rest the floor tiles. Each piece is tapered so as to give a constant taper throughout the retort.

Section of Retort.

The size and section of the retort is an important matter, and at the outset received very careful consideration. As those of you who inspected the empty retort will have seen, the section is rectangular, with rounded ends. This shape of retort has been used in the Glover-West system from the earliest experiments, and has been found most satisfactory for the proper filling of the whole section with coal, the carbonizing of the coal (minimizing the tendency to the hanging-up of the charge), and also for the even and continuous extraction of the coke.

Producer.

The producer is made of ample size, and is constructed with a curtain arch, behind which passes the producer gas. The level of coke in the producer is never allowed to get below this curtain, so that a constant quality of producer gas is supplied to the setting.

Heating of the Secondary Air.

The secondary air enters on the non-producer side of the setting, and is made to pass round the cast-iron section. It then passes into the chamber above, where it comes into contact with the built-up sections of retort, and onwards into the vertical secondary-air flue. This method of construction serves two very important objects of the system—*i.e.*, the heating of the secondary air and the cooling of the coke; the latter, as you have seen, coming out of the coke-chamber cool enough to be handled with a gloved hand.

System of Heating.

The system of heating is of peculiar interest, because it enables the retorts to be kept under perfect control. The bed is divided horizontally into eight separate combustion chambers by suitable floors. On the producer side, and running vertically, is a twin producer gas-flue, on each side of which is a secondary-air flue. At each floor there are two sets of nostril holes provided with suitable dampers, so that the temperature of each floor can be adjusted to a nicety.

The waste gases from the eight combustion chambers collect in a vertical flue running parallel with the producer-gas and secondary-air flues; this flue also being on the producer side of the setting. These gases are made to circumvent the retorts in the two chambers at the top of the bench. In this way, the gases are made to give up practically all their heat, and the incoming coal is dried and heated to some extent in preparation for the process through which it has to pass. The waste gases, after having performed this operation, are carried away to a short chimney; each bed being so provided.

The controlling dampers of these settings need very infrequent readjustment unless the quality of coal to be carbonized is altered very materially. In the old setting at St. Helens, during the carbonizing of mixed small coals, the dampers have remained untouched for upwards of twelve months at a spell.

The coal gas off-take is on what may be termed the top mouthpiece. Alongside of it is a ball-valve provided with a hole down which can be put a trial rod, which is used to determine the depth of raw coal in the retort. The gas immediately passes into a dry main of large section, which enables it to deposit a considerable amount of the heavier tarry vapours. These collect at the bottom of the main, and are taken away by a separate tar-main. Proper arrangements are provided for the cleaning of the collecting main by the provision of large cleaning doors.

Scurfing.

The scurfing of the retorts is a very simple process. When a retort requires scurfing, the extractor screw is kept at work while the coal-valve remains closed. In this way, the retort empties itself in about twelve hours. The retort being empty, the ball valve on the top mouthpiece is turned to the open position—*i.e.*, there is a passage of about 1-inch diameter. The bottom mouthpiece is then left open, and there is a constant current of air through the retort, loosening the carbon and facilitating its removal with a chisel bar.

It may be of interest to some of those present to know how a retort is put to work again after being off for scurfing. This, of course, applies to a bed of retorts which is being re-started. The retort is first filled with coke (special provision being made to facilitate this), the coal-valve is opened—thus allowing the measuring chamber and the uppermost part of the retort to be filled with new coal—the extractor is then put into operation, and the coal is gradually brought down into the carbonizing area of the retort.

Expansion.

In every retort-setting—whether horizontal, inclined, or vertical, intermittent or continuous—there are expansion and contraction; and it is very largely due to these two forces that a retort-setting does not last longer than (shall we say), on the average, 1000 days actual working.

In any intermittently worked setting, expansion and contraction take place every few hours. It has been determined that, on charging a retort in the usual way, the temperature of the inside surface of the retort is reduced about 300° C.—*i.e.*, from 900° C. to about 600° C.

If we consider that the outside of the retort is in a temperature of 1200° C., we may conclude that there is a difference of 600° C. between the highest temperature of the outside surface and the lowest temperature of the inside surface. There is a constantly varying temperature between these two extreme points from the outside to the inside of the retort; the greatest difference taking place throughout the thickness of the retort when it is charged. On the other hand, in a continuously worked vertical retort, the temperature at a given point, either inside or outside of the retort, is practically constant, provided that the temperature in the combustion chamber is constant. In this way, the strains on the retort and setting are kept at a minimum.

Flexibility.

The flexibility of the setting is a point which should be considered. Given perfect control over the quantity of coal passing through the retort, and the heating of the retort at any given point—as is done in the Glover-West system—then it is possible to vary the make at least 50 per cent. This was actually done in starting-up one of the smaller plants, where only half the make of the bench was required for some little time. The whole bench was put to work, but so adjusted that it carbonized exactly half its full quantity of coal.

Applicability to Smaller Works.

Not the least of the advantages of the Glover-West vertical retort system is the applicability and suitability of the system for small and medium-sized works. Hitherto gas-works with an annual output of from 40 to 150 millions per annum have not been able to introduce labour-saving devices and appliances which were in the market prior to the introduction of the vertical retort—primarily owing to the fact that, while the introduction might be justified during the winter months, no appreciable saving could be effected during the summer months, after taking into consideration the capital expenditure and the upkeep of the machinery.

That the Glover-West system meets the case of such works is emphasized by the fact that it is already in successful operation at Helensburgh and Lurgan—the former having an annual output of, approximately, 68 millions and the latter 44 millions. In each

case, the plant is manufacturing the whole of the output of gas for the town.

The system has also been adopted, and is in course of construction, for the following gas-works under this class:—

Heywood	Approximate Annual Make of Gas.	133 millions
Cambuslang		58 ,,
Bridgwater		88 ,,
Tipton		131 ,,
Barnoldswick		54 ,,
Lytham		88 ,,
Dunoon		42 ,,

The total capacity of the foregoing installations ranges from 250,000 to 500,000 cubic feet of gas per 24 hours; and the retort-settings are arranged so that the units can be one or two retorts, as desired, and thus meet the increase or decrease in the supply of gas.

Wear and Tear.

On the question of wear and tear, there is now satisfactory evidence, from the experience gained in the operation of several plants, that the cost of renewals will be exceptionally low. In the first place, there is a minimum amount of machinery in the operation of the mechanical movements of the plant, and the mechanism is extremely simple and slow-moving. The coal-handling machinery is generally similar to that adopted in connection with stoking machinery for horizontal and inclined retorts; and the wear and tear, therefore, should be on the same basis. But with regard to the coke-handling machinery, inasmuch as the coke is discharged from the coke-chambers in a cool state, it is nothing like so destructive to coke-conveyors or other coke-handling machinery, as is the case with coke discharged from horizontal or inclined retorts requiring a considerable amount of quenching.

Aims and Attainments.

The following is a summary of the aims and attainments of the Glover-West system:—

Increased make of gas per ton of coal carbonized.
Large yield of gas per ton on a given area.
Constant illuminating power and calorific value, and uniform composition of gas throughout carbonization.
Low percentage of inert gases.
Coke of improved quality.
Increased value of fluid residuals.
Tar low in naphthalene and free-carbon content.
Low naphthalene content of gas.
Utilization of the heat from the residual coke.
Low consumption of fuel for heating the retorts.
Complete control of the heat.
Absence of smoke, dust and steam nuisances, and, therefore, better conditions for the men employed.
Less arduous labour.
Lower working costs.
Simplicity and complete control of the discharge apparatus, and the ready adaptation of the plant to suit the different classes of coal.
Regular coal feed.
Regularity of output of gas with consequent increased efficiency of the purifying and condensing plant.

DISCUSSION.

The Chairman (Mr. Heald) said that to his mind one obvious advantage of a vertical retort installation was the good opportunity it afforded of getting excellent producer gas results. Another point which appealed to him was that double regeneration was secured—*i.e.*, the secondary air, when approaching the combustion chamber, was heated by the hot coke coming away from the retort. It was then that the waste heat, instead of being used to warm the secondary air, was utilized to bring the coal into a right state. This seemed to him to be a great advantage, because the coal was gradually warmed up to do its work. Another aspect of the paper which surprised him—though he could hardly use the word "surprised" in its literal sense, although he confessed to being rather surprised—was the number of small gas companies who had adopted vertical settings. When labour-saving appliances were new, it was usually the case that small gas-works fought shy of adopting them; but apparently it was not so in this case. It was certainly unusual for small undertakings to adopt new inventions when they were practically in the experimental stage. Mr. Glover, in his paper, had pointed out that a small place like Lurgan, with an annual make of 50 millions, had had the pluck to put in verticals. This being so, it showed that the vertical retort was now well out of what they might term the experimental stage. The fact that installations could be erected so as to work only one retort was, to his mind, a great point in their favour. Another advantage which appealed to him was the apparent freedom from naphthalene troubles and stopped pipes. He was greatly handicapped by the latter; it was one of the bugbears of his retort-house, and not a very pleasant one. If vertical settings removed the stopped-pipe trouble, this was another obvious advantage in their favour. The only question which struck him as affording opportunity for criticism was the small amount of ammonia extracted per ton. Mr. Glover, he thought, said it was 22 lbs. He (Mr. Heald) had no doubt some of them did get as low a yield as this; but they must admit that it was an extremely low figure, when 28 lbs. and 29 lbs. were usually obtained. This was the only point he had to bring against vertical retorts.

Mr. Samuel Glover (interposing): The author of the paper quoted the figures 29·2.

Mr. Heald thanked Mr. Glover, and said that after this correction his only objection was swept away. Continuing, he remarked that when one looked down the list of advantages which Mr. Glover claimed for vertical settings, it represented a rather formidable document, embracing everything from the "increased make of gas per ton of coal carbonized" to "regularity of output of gas, with consequent increased efficiency of the purifying and condensing plant," and carrying along with these advantages such important items as "low naphthalene content of gas" and "low consumption of fuel for heating the retorts." Every attainment claimed for vertical settings by Mr. Glover, and set forth in his paper, was, in his (the speaker's) opinion, fully merited.

Mr. J. Alsop (Stockport) asked whether he correctly understood from the paper that carbonizing costs could be very readily reduced by 50 per cent. On his way to the meeting, one member had asked him how the scurfing of the retorts was accomplished; and he (Mr. Alsop) thought that if his questioner had seen the coke extractor-worm, and how it was made—*i.e.*, so as to turn one half over the other—he would readily see that a clear way was left for the chisel-bar, and also a free current of air for the removal of the carbon. He (the speaker) was sure the members had derived great benefit from the reading of the paper. Mr. Roland Glover had explained matters in a very lucid manner; and they were greatly indebted to him. They were also indebted to Mr. Ward, for the very courteous way in which he had explained everything to them at the gas-works. He (Mr. Alsop) strongly counselled members not to be afraid of asking questions. They all knew how frequently it happened that when a question was put the seeker after information received the very answer he thought it would be. This, however, should not prevent members putting questions, for the reply of the expert removed any doubt which might have existed in the questioner's mind. Surely this was beneficial questioning.

Mr. W. Buckley (Manchester) said his experience of vertical installations had been chiefly confined to the chemical, or experimental, side of the question. He could fully bear out everything Mr. Roland Glover had said. The installation at Droylsden—the first one erected—was working beautifully to-day.

Mr. J. T. Haynes (Liverpool) said Mr. Buckley had alluded to a make of 14,901 cubic feet per ton; but it contained no reference to quality. Did he enrich the gas with air? [Laughter.] He (the speaker) had heard of this being done at a small works. [Renewed laughter.] Was any section of the retort heated more strongly than another? A further point raised by the questioner was how often the retorts had to be scurfed.

Mr. R. Glover, in reply, said, with regard to the heating of the retorts, one of the greatest advantages of the Glover-West system was the ability to heat the retort exactly where it was desired. As to scurfing, the answer was eight weeks.

Mr. Fairhurst (Altrincham) asked whether, in the event of a charge "getting stuck," there was any risk of careless workmen damaging the side of the retort by poking it.

Mr. R. Glover replied that it was very seldom nowadays that a charge was "hung up." With vertical retort plant, it was, of course, essential that men employed should properly understand their work. It was not merely a "shovelling question"—*i.e.*, simply shovelling the coal into the retort. While it was, perhaps, possible that slight damage could be done by probing, he desired to emphasize the fact that the retorts were made of very good material. They were, however, very smooth inside; and it would be practically impossible for a probing-bar to go into the side. The shape of the retort was such that any poking required could be done without causing damage.

A Member remarked that Mr. Glover had alluded to the possibility of regulating the heat to certain classes of coal. Could he give them a guide to go by, so as to distribute the heat? Moreover, what would be the result if "fat" coals were in use? How would he find it out?

Mr. R. Glover said the "fat" coal question was usually determined by experience. In testing the vertical system, practically all the gas-making coals had been experimented with; and they became so proficient in working, after seeing so many classes of coal pass through the retorts, that they could indicate where the heat ought to be.

Mr. Buckley remarked that the word "naphthalene" was never heard at Droylsden.

Mr. Vauston (Bolton) said allusion had been made to the advisability of small undertakings adopting vertical retorts. Would there be any objection to having half-quantities in little works; and could outlay be lessened by taking up the coal in a hoist?

Mr. R. Glover pointed out that each of the retorts could be heated separately. He knew one instance where a small installation was at work; and he believed no elevator was used for conveying the coal, but that it was taken up in some form of hoist.

The Chairman asked what was the weight per square yard of the St. Helens installation. He said it struck him as having a heavy-looking lot of brickwork in its construction. It was, however, extremely small for the amount of work done in the retort-house. He would also like to know, if it was possible for the information to be given, how many cubic feet of gas could be produced per square foot or square yard of room occupied by the retort-house floor.

Mr. R. GLOVER said he would forward the desired information to his questioner.

Mr. SAMUEL GLOVER expressed the hope that his presence during the reading of the paper and subsequent discussion had not interfered with the "free flow of thought" and the free expression of any idea which might have been in the mind of any member. Personally, as an experienced man in gas engineering matters, he had been delighted to observe the grip which the members seemed to have of the subject of vertical retort installations. If proof of his statement were wanted, he need only allude to the very large number of intelligent questions which were addressed to him during the inspection of the works.

[Mr. Glover afterwards, by means of a large coloured chart showing the continuous carbonization of the Glover-West vertical retorts, dealt with one or two of the more interesting points which had been raised. It should be added that when he rose to address the members, at the request of the Chairman, he was received with applause which indicated how remarkably appreciative the juniors were of his eminent services to the gas industry. There was no mistaking the spontaneity of his reception.]

On the motion of Mr. HERBERT HAYNES (Liverpool), seconded by Mr. FAIRHURST, a cordial vote of thanks was passed to Mr. Roland Glover for his excellent paper. The last-named speaker added that there was, no doubt, a great future for vertical retorts; but the greatest difficulty at the present time was their cost. He hoped they would become cheaper in the course of time.

Mr. R. GLOVER briefly thanked his fellow-members, and remarked that his efforts had been a labour of love.

MODERN SYSTEMS OF COAL CARBONIZATION.

Views of an American Gas Engineer.

At the Annual Meeting of the New England Association of Gas Engineers lately held in Boston (Mass.), Mr. R. B. BROWN, the Engineer of the Milwaukee (Wis.) Gas Company, read a paper in which he gave his impressions of the various systems of carbonization now before gas engineers. The following are some extracts from his communication.

The destructive distillation of coal as a means of separating the volatile constituents from the fixed carbon for the utilization of the oils and tars, for the recovery and use of the gas, for obtaining the resulting coke, and for various combinations of these requirements, has been carried on for more than a hundred years. The methods employed for each requirement have not, however, varied very greatly for a number of years past. The treatment of the coal, particularly when considered with reference to the production of gas, is often, even to-day, of the crudest possible description. Our knowledge of the proper treatment of the delicate hydrocarbons evolved during the process of distillation is not what it should be; and yet we know much more about what should be done in our handling and heat treatment of these hydrocarbon vapours than would appear from the actual processes as practised in our various systems of carbonization.

The manufacture of coal gas on a large scale in recent years has been reduced to a point where there are really only a few places in which very great savings may be made. The large items in the expense of manufacture are almost wholly divided between the cost of handling the coal and coke, which is now universally done by machinery, the cost of direct carbonization, and the cost of the material used. The carbonization labour can be, and has been, reduced in every process at the expense of increased capital costs, and in most of them at an increase in maintenance and depreciation of plant. In some cases, the saving in labour has not been sufficient to justify the increases in fixed charges. However, while first cost is an important item, I would not have you forget that the return on the cost through reduction of labour and increase in profits, and, last but not least, through reduction of maintenance, may wholly justify the investment.

The problems which confront us in obtaining sufficient skilled labour to operate some of the older-type retort-houses, and which may confront us in the future in handling newer types of houses in which the actual effect upon the labour has not been so fully considered as it might be, will have more to do with the future of processes and methods than the dollars and cents cost might appear to show.

New England men are peculiarly favoured to-day in that in making your comparisons of processes and plants you do not have to go outside your own bailiwick for working examples of nearly every form of carbonization plant and processes now entering into the problem. You have in operation the older-type retort-houses in every stage, from handwork to the adoption of machinery as of eight or ten years ago; you have some good examples of inclines of the type that created so much interest, both abroad and in America, some eight to ten years ago; you have installations of horizontal throughs that were built during the last decade, equipped with what, at the time, was considered to be the latest and best of machinery; and you have installations showing the last word in vertical equipment three years ago. Your oven installations are not quite as near up-to-date as some that have been built and are being built to-day; but their good and bad points are probably known well enough to you to keep up your interest in this process of carbonization, and to ensure that you would give it its full measure of consideration in any study or comparison that you are about to make. You have a recent American-built plant of the continuous vertical type; and, finally, you have had fired within a few months the latest word in the direction of horizontal throughs, with perhaps the most highly developed machinery installation the world has ever seen.

For every one of these types of carbonizing plant good things can be said, and truly. It is probably just as true that with every one of them we may find fault, and it is indeed a difficult matter to balance the good and bad points, keeping in mind at all times those additions to fixed charges which most inevitably follow the reduction of labour. I believe that the most important items to be considered so far as these changes are concerned must be, first, the treatment of labour—that is, as to what endurance of hardships and severity of manual labour we may reasonably expect of the men employed in these plants in the future. Next, the utilization to the utmost of all the available value in the raw material, which in this case is coal. We know that the visible supply of satisfactory coal for the manufacture of gas is not increasing, but that the cost of mining it must inevitably increase; that the reasonable return to the owners of the coal land has not been paid in many cases in the past, and, therefore, probably will increase in the future. Again, we must take into account the general and far-reaching effect of the education of the public upon lines of the conservation of natural resources. Everything points to the one end. We must conserve every heat unit of energy that can be taken from the coal, and every cent's worth of value in the residuals left after our primary purpose is accomplished.

It will, perhaps, be in order now to attempt to give you a few of the significant features of the several processes above enumerated, as they appeal to me.

Of the old-type horizontal houses, operated by manual labour, nothing need be said, except that I feel sure that none of you would consider the installation of such a plant to-day, and that you would all feel that it was proper to replace such installations as increased requirements gave opportunity.

To inclines I paid my respects some years ago; and in practice, and in the study of results obtained by others, I have not had occasion to change my views since. While they were a great improvement over some of the other plants which were being used and built at the time they were at the height of their popularity, I do not feel that they in any particular justify the cost of building. They do not fulfil the requirements of proper treatment of the gas in the process of carbonization; they do not improve labour conditions for the men; their maintenance is very high compared with the amount of gas made; and, while a serviceable and practical plant, it is not one that we shall hear very much of in the way of new construction in the future.

The intermittent vertical installations, so far as I have been able to learn, have, in present types of construction, developed several difficulties, some of which are inherent in the type and others merely in the design. In the most commonly known design, the difficulty of maintaining tight connections and tight retorts is probably responsible for a great deal more of the shortage of yield as compared with some other contemporaneous retort installations than is commonly supposed. The combined leakage from all openings in those installations which I have seen and heard about is quite considerable.

The trouble experienced from the swelling of coal in the filled retort, with distortion of the retorts from this and other causes, including irregular heating, causes frequent hang-ups or bridging of the coke in the retort; and the effect on the labour situation, in my opinion, is to make it worse, if anything, for the stokers than in many of the old-time hand-operating houses. The theory advanced by the operators of the verticals, that the gas is protected by its passage through the uncoked core of coal, does not seem to be borne out by some other factors and results.

The tar, while very large in yield, shows a surprisingly small amount of light oils and benzols; and the candle power of the gas is not so high as would be expected were this condition met with in their operation. It is well known that there is no way by which the candle power can be stripped from coal gas more easily than by passing it through heated coke or over extremely hot spots in the retort or oven surface. The disproportion in the candle power found with these verticals may possibly be due to some such division of the travel of the gas. Again, the vertical settings are, some of them, pretty hot towards the top; and with the retort tapered, which is considered necessary in order to overcome the tendency to hang-up in discharging, it is possible that the coking takes place through the upper part of the charge fully as rapidly as it does through the lower and thicker part, and that the uncoked core does not exist for a considerable portion of the coking time. The one installation of continuous verticals has not been in operation here long enough to receive more than our passing interest, with a note to keep an eye on them for the future.

The very high fuel reported from some of the vertical installations is evidently due to several causes—first, improper design of the producers and difficulty in the uniform distribution of producer gas and secondary air to the setting; secondly, to the very large radiating surface exposed in this type of installation. Undoubtedly much of this excessive use of fuel can and will be obviated in future installations through better design. The radiation can also be very greatly reduced, though it will add somewhat to the difficulties which the designer will have to overcome, and also to the first cost of construction. As to the quality and quantity of residuals, the ammonia results are good; tar is large in quantity and good in quality;

and the coke is good, though that which I have seen is not so good as one would expect from this process of carbonization, while comparing very favourably with that from most of the other retort processes.

In horizontals operated by machinery, it seems that the line of development has most definitely and certainly proceeded in the direction of through retorts of moderate length, discharged and charged in the one operation by a single machine. This method is practically restricted to two types of machines now in use. The English machine has not been in operation in America long enough for us to say very much about its mechanical efficiency or durability. It has not been developed to anywhere near the refinement of the American-type machine; and I personally believe that it has some defects in the distribution of the charge which it will be quite difficult to entirely eliminate. However, this general type of machine must, I believe, be the one towards which all development of horizontal retorts operated with machinery must progress.

The remarkable results obtained with the later installations of horizontals with machinery, while quite startling to many of the older gas men who have seen coal carbonized for several decades without any material increase in yields or change in the quality or quantity of gas or residuals, are not so remarkable when analyzed in detail. The conditions for the distillation of all the volatile matter, as any laboratory man can tell you, comprise two elements—temperature and time. In other words, a very high temperature for a very short time may drive off practically all the volatile constituents in the given sample or charge of coal. Exposure of the same sample or charge to a lower temperature for a longer time will do the same thing. But the condition in which the volatile matter is recovered in the one case and in the other may be very different.

In the old-fashioned retort process, with partially filled retorts, whether horizontal or inclined, the passage of the gas from the retort was slow; its exposure to the highest temperature in the retort was prolonged; and through this heat treatment necessarily there was more breaking-down of the more sensitive hydrocarbons in the tar and in the gas, resulting in more lampblack in all stages of the process and in a lower candle power and heating value for the gas. By the newer process, with the nearly filled retorts, the gas must escape very rapidly from the retort; carbonization at lower temperatures still further adds to the protection of the gas; and last, but not least, the very uniform heating obtained in some of these modern settings prevents any portion of the gas from coming in contact with extremely hot spots. The avoidance of spilling coal or of leaving coal to "stew" upon the cooler portion of the setting walls and mouthpieces, results in the delivery of pretty nearly the last possible fraction of a cubic foot from every pound of coal that goes in.

The reduction of the loss in carbonaceous material found in the stand-pipes and in the hydraulic mains adds its further fraction of a cubic foot to the registered yield, and the absolute uniformity of heats and charges possible with the more modern construction and designs of benches, controlling devices, and charging machinery, does away with the trouble, which used to be so disheartening in the older-type houses, of inability to properly proportion varying charges to varying heats. In other words, the yield that is gained on the day shift to-day is not lost on the night shift to-night.

In at least one type of construction now before us, the periodic variation of heats due to the cleaning of producers is practically done away with; and I think any student of carbonizing problems who will admit that each of these little details has been carried out, cannot be surprised when told that the increase in results, particularly in yield, was what it is now known to have been.

Radiation and heat lost in the flue products have always comprised a great part of the heat from the fuel used. Systematic and apparently successful attempts have recently been made to prevent the one, and to recover in useful form a great part of the other, loss. This reduction of fuel promises one of the largest savings recently made in the cost of operation.

So far I have confined my thoughts to the carbonization of coal in retorts; but to-day its carbonization in bulk through the various types of coke-ovens and so-called chamber ovens must be seriously considered in many places before any decision as to type of plant is arrived at. The bye-product coke oven is, and has been for many years, an efficient device for the manufacture of coke as its primary product. Its efficiency in the production of gas as a primary product has not been so uniformly high. To obtain a very great advantage in economy of labour in the handling and carbonization of coal in large bulk, and also certain peculiar advantages in the quality of the coke produced, has been essential to their success. Coke-ovens have, however, been developed along lines which did not produce the highest efficiency in other directions. The operating cost per ton of coal carbonized has been steadily reduced, among other things, by the increase in the size of the charge, the length and depth of ovens, &c. But this has only aggravated one of the primary difficulties in all coke-oven construction to-day, and that is the control and uniform distribution of heat to the charge.

Improvements in this direction have been made in recent years. The almost universal adoption of silica for linings and flue tiles has greatly improved the heating efficiency of all types of ovens, and reduced their fuel account correspondingly; but the problem of uniform distribution of heat has not yet been satisfactorily solved. Every system has its own peculiar conditions; and the adherents to each will convince you of the extreme difficulty met with in obtaining uniform distribution through the system employed by their competitors. But the truth is that they all have their troubles; and to these difficulties may be more or less directly traced the lower initial candle power found in most of the gas derived from installations of bye-product ovens. The large quantity of fuel required for carbonization is due partly to this difficulty of distribution and partly to the excessive radiating surface and the outdoor exposure, which considerably increase radiation, particularly in northern climates.

In considering coke-ovens as a direct source of the manufacture of gas for distribution, one must first look at the coke market tributary to the location, and carefully study what may be done in the way of business development, as with the coke-oven plant the largest product is the coke. If this question can be satisfactorily answered, the plant has many advantages. Its first cost will be less for a given unit of carbonization, and usually its cost of working will be less. On the other hand, there are, in my opinion, more uncertainties in the operation than there are with the modern types of retort carbonizing plant. The economical handling of the coke-oven plant requires prompt and ample shipping facilities. As soon as it becomes necessary to stock or rehandle the coke, the balance of economy of operation in favour of the ovens is usually lost. We therefore, so far at least as economical operation is concerned, must add to all the labour and machine risks of the operation of any plant those extra risks which may arise from car shortage, state of weather, or labour conditions of the railroad furnishing the service.

In northern latitudes, where every sudden drop in the temperature, whether or not accompanied by snow, increases our output demand for gas, the coke-ovens may confidently be expected to reduce their output at the same time. With the latest improvements in oven construction—independent producers, mechanical draught, better distribution of heat to the ovens, and many others—it is to be expected that this unfortunate tendency of the outdoor oven will not be so acute as it has been in the older plants. But, from the nature of things, I do not believe that this type of equipment can be made as reliable in the face of violent changes in weather conditions as the better-protected retort installations are known to be.

When your turn comes to be forced to make a choice of the type of carbonizing equipment to be installed, I do not believe that I should recommend any of you to attempt to decide beyond these general features as to what each equipment will positively give you in the way of results. There are enough responsible manufacturers engaged in the construction and installation of all these types of plant in America to enable one to call for absolute guarantees on all the essential details of operative results. Again, one can call for results as shown by actual installations in operation for a sufficient length of time to give a reasonably reliable basis for the figures claimed. Then careful personal inspections of such plants will tell an experienced operator much as to the troubles met with in operation or otherwise. A composite of all these factors should give us a pretty fair picture of what we seek for in the ideal coal-carbonizing scheme. To me, frankly, it looks like horizontal retorts, except where local conditions give coke-ovens a decided cost preference. You may perhaps decide otherwise; but do not allow apparent popularity, glittering estimates, or claims of any sort, to do your deciding. Go and see for yourself; and when anyone tells you what his system can do, ask him how he intends to prove it.

"Transactions" of the American Gas Institute.

We have received the "Transactions" of the American Gas Institute for the past year. The contents consist of the report of the proceedings at the seventh annual meeting, held in Atlantic City, New Jersey, from Oct. 16 to 18 last, under the presidency of the Hon. I. C. Copley. Most of the papers and reports presented at the meeting have been noticed in the "Journal." Particulars are also given of the life-work of members removed by death during the year. These are followed by a reprint of the pamphlet on "Light: Its Use and Misuse," issued by the Illuminating Engineering Society of New York, and in part reproduced in the "Journal" for Nov. 26 (p. 659). A feature of the volume is an index to the "Wrinkles" presented at the preceding meetings of the Institute, prepared by the Wrinkle Department Committee in accordance with a resolution passed in 1911. The "Wrinkles" have all been edited and classified, and they can be easily referred to by the aid of the index. The rest of the matter comprises the constitution and bye-laws of the Institute, the names of past officers of the merged Associations, and lists of the present members arranged first alphabetically and then geographically. The volume, produced under the editorship of the Publication Committee, consists of 1005 pages. The technical matter is fully illustrated. For a frontispiece there is a portrait of the President.

Recent Wills.—The late Mr. Leonard Rodwell Wilkinson, a Director of the Imperial Continental Gas Association and of the British Gaslight Company, whose death was announced in the "Journal" for the 18th of February, left estate valued at £40,946 gross, with net personalty amounting to £37,287. Mr. George Crofts Williams, a Director of the Cardiff Gas Company, left estate of the gross value, so far as could be ascertained at the time probate was granted, of £314,333. Mr. W. Cowley, the Manager and Secretary of the Spennymoor and Tudhoe Gas Company, left property valued at £3137.

THE HANDLING OF FURNACES.

The current number of the "Gas Institute News" of the American Gas Institute contains, in the Educational Department, which is conducted by Mr. Alfred E. Forstall, an article on the subject of the handling of furnaces.

The author begins with direct-fired furnaces, and remarks that, since the important disadvantage of single-stage combustion is the necessity of passing through the fire an amount of air containing more oxygen than actually combines with the carbon, the chief point connected with the operation of these furnaces is to see that no more air is allowed to pass through the fire than is absolutely necessary to prevent any carbon from being only partially consumed, with the formation of carbon monoxide, and to prevent the passing out with the ashes of too much unconsumed carbon. To bring about this result, the size of the openings through which the air is admitted into the space under the grate should be regulated till it is just sufficient to pass the quantity of air that will result in complete combustion of the carbon to carbon dioxide.

The escape of carbon monoxide from the furnace can be detected by the appearance of a blue flame when air is admitted to the take-off flue, or chimney, at any point where the temperature is high enough to ignite the gas when it comes in contact with air, and yet not so high as to make it difficult to observe the flame. If the total length of the take-off and chimney is short, the flame will show at the top of the chimney. The operation of the furnace should be frequently tested in this way; the area of the air inlets being increased when the flame shows, until the flame just disappears, and decreased when no flame can be seen, until flame appears, and then increased until the flame disappears. In addition, it is necessary to see that the force acting to draw the air through the opening does not vary too much, since the amount of air drawn through a given opening will, of course, vary with the force acting to draw it through. This force in the case of a furnace opening into a chimney is the draught of the chimney less the resistance encountered by the air in passing through the fuel bed. This resistance varies with the depth of the fuel and the extent to which the different pieces of fuel, and of the ash which has resulted from the combustion of part of the fuel, are packed together.

The depth of the fuel bed should be varied to suit the size of the pieces of which the fuel is composed. When these are large, the area of surface exposed by the fuel to the air passing through the fire is smaller, in proportion to the volume of the space occupied by the fuel bed, and the individual spaces between the pieces are larger than is the case when the pieces are small. Therefore, with fuel in large pieces and a given area of grate, it is necessary to have a deeper fuel bed than is required with small pieces to provide the amount of contact between fuel and air necessary for the complete combustion of the carbon without using an excessive amount of air. This is also true for a light, porous fuel like coke, as compared with a dense, heavy one like anthracite coal. It is also more difficult to draw the air through a given depth of a fuel composed of small pieces than through the same depth of a fuel composed of large pieces; and therefore the necessity of working with a given chimney draught, which in any case should be kept as small as possible, also makes it necessary to use a thinner fuel bed for fuel composed of small pieces.

In furnaces having a deep fuel bed, and consuming the carbon to carbon monoxide in two stages, there are two supplies of air to be looked out for; and it is important that neither of these should be too large. If too much primary air is admitted to the furnace, the result will be that the gas passing off to the combustion chamber will contain a large percentage of carbon dioxide, and the combustion there of this producer gas will not generate so much heat as would be derived from a gas produced from the same amount of carbon, but containing more carbon monoxide and less carbon dioxide. It is, therefore, necessary in generator furnaces, as well as in direct-fired furnaces, to restrict carefully the amount of air passing through the grate to the fuel bed. It is also necessary to keep the force acting to draw the air through the fuel bed as small as possible, without reducing the quantity of air below what is required to give the amount of producer gas necessary to perform the work the furnace is called upon to do. The secondary air, or air admitted to the combustion chamber for the purpose of burning the producer gas coming into it, must also be carefully adjusted to the smallest amount that will prevent the escape of any unconsumed carbon monoxide to the chimney, if the waste gas is passed directly to the chimney, or to the generators or recuperators, if either of these appliances is interposed between the combustion chamber and the chimney.

In handling a generator furnace used to heat a bench of retorts, the first step in the operation is so to adjust the draught on the furnace that there is neither an undue pull nor an undue pressure above the fuel bed. A good working method of securing the proper adjustment is to open the charging-door, throw on top of the fire a handful of bituminous coal, and observe the action of the flame produced. If it flares steadily out of the door, there is not sufficient draught on the furnace, and the chimney dampers should be opened a little wider; but if the flame is drawn steadily up into the combustion chamber, there is too much draught on the furnace, and the chimney dampers should be pushed in. The proper adjustment has been obtained when this flame plays lazily backwards and forwards in the charging-door opening—being neither drawn in steadily nor flaring out steadily, but coming out of the opening for one instant and then being drawn down into it the next.

Having obtained the proper amount of draught, the next step is so to adjust the air passing through the fuel bed that the amount of producer gas supplied to the combustion chamber will be sufficient to do the work the furnace is required to do. This adjustment is made by varying the area of the openings through which the primary air is admitted under the grate of the furnace. With the proper draught and any given amount of primary air opening, the maximum amount of heat will be produced and utilized when the secondary air supplied to the combustion chamber is just sufficient to consume the combustible portion of the producer gas. Since this consists practically of carbon monoxide, which burns with a very characteristic blue flame, a good working method of determining whether the proper amount of secondary air is being supplied at any given time is to observe the conditions, as to the presence or absence of flame, which exist at some point in the take-off flue leading to the chimney at which the temperature is not too high. If a blue flame is visible, it shows that the supply of secondary air is not large enough; and the area of the secondary air openings should be increased until this flame just disappears. Only small increases in area of opening should be made at any one time, and ample time should be allowed for the increased amount of secondary air to reach the combustion chamber, and for the waste gases produced after this air has reached the combustion chamber to reach the point of observation before any further change is made. If no flame is visible at the point of observation, and no adjustment has been made for some time, the area of the secondary air openings should be slowly decreased until a flame appears, and then increased, as before, until the flame just disappears.

This method of adjustment of the secondary air works very well when the furnace is used in connection with recuperators, since at the outlet of these the temperature of the waste gases has been reduced to that at which the appearance and disappearance of the carbon monoxide flame can be detected very accurately.

Means should be provided for securely fastening the slides or shutters closing the air openings; and when the adjustments have been made, these should be fastened so that they cannot be moved unintentionally. The chimney dampers should also be furnished with devices that can be set in such a way as to prevent the damper from being pushed in too far, and to show at a glance if the damper is pulled out beyond the point at which it furnishes the desired opening. No changes in the setting of the air slides or chimney dampers should be made except by or upon the written authorization of, in the case of gas-works, the retort-house foreman or the works manager, as may be determined by local conditions. Records should be kept showing for each furnace the extent to which the air slides and dampers are open at any time, and the changes which have been recently made.

Too much stress cannot be laid upon the importance of careful attention to this regulation of the amount of draught upon, and the area of the openings admitting air into, a generator furnace or producer. In practically all the cases in which poor and uneconomical results are obtained from such furnaces, it is because this regulation of dampers and air-slides has not been properly attended to at the start, and is not carefully checked at regular short intervals.

If the fuel consisted only of carbon, the handling of a generator furnace or producer would call only for this attention to the proper adjustment of the chimney dampers and the areas of the openings through which the air supply is admitted. Unfortunately, however, all commercial fuels contain, in addition to the carbon and other combustible matter, incombustible mineral matter which forms ash. This is usually fusible at temperatures that are apt to be reached in certain portions of the fuel bed; and after having become soft and plastic at this higher temperature, it passes to a zone of lower temperature, and as it cools forms a clinker, which in many cases is very hard. As a rule, this clinker causes a great deal of trouble, by interfering with the passage of air through the fire; and unless it is frequently removed, it upsets the working of the furnace.

In direct-fired furnaces, in which it is necessary to have the complete combustion of the carbon take place in the fuel bed, and the conditions are not such as to warrant the regular use of a secondary air supply to consume any combustible gas that may escape from the fire, nothing can be done to reduce the temperature in the hottest part of the fire apart from the regulation of the air supply previously spoken of. In generator furnaces, however, it is not necessary to produce so much heat in the fuel bed as is the case with direct-fired furnaces; and there is a secondary air supply. It is, therefore, possible to take steps to reduce the temperature of the hottest zone of the fire, even though these steps lead to the formation of combustible gases.

The method commonly employed to reduce the temperature of the hottest zone in the fuel bed is to mix a certain proportion of water, in the form of steam, with the primary air. If sufficient steam is employed, and it is thoroughly mixed with the primary air so that no air reaches the fuel unaccompanied by steam, the highest temperature in the fuel bed will not reach the point at which the ash of such fuels as are ordinarily used will fuse to an extent sufficient to cause trouble from clinker; and this feature of operation is eliminated. The combination of carbon and the oxygen which it drags away from the hydrogen in water can produce either carbon monoxide or carbon dioxide; and in a generator

furnace it is, of course, desirable that the former should be produced. The presence of steam in large quantities tends to reduce the temperature. It is therefore necessary to carefully regulate the amount of steam supplied to the fire; and practical experience has shown that the best results can be obtained in furnace operation when this is kept about 0·5 lb. for every pound of fuel burnt in the producer.

When steam is used in this way to prevent clinker, part of the oxygen required for the combustion of the carbon is furnished by the steam, and therefore does not have to be drawn from the air; and the amount of primary air required is smaller than if no steam is used.

Carefully conducted experiments have shown that the reduction of carbon dioxide to carbon monoxide takes place freely only at temperatures above 1000° Fahr., and does not become at all complete until the temperature is about 1800° Fahr. It is, therefore, important that the temperature should be maintained as high as the latter figure throughout a sufficient depth of fuel to furnish the amount of contact between the carbon dioxide and carbon monoxide which is necessary to complete the reduction of the former to the latter so far as this can be carried out under practical conditions of operation. This fact has an influence upon the area of the fuel bed in proportion to the amount of fuel which is to be burnt in a given length of time. It is a not uncommon belief that the larger the area of the grate, or the area of the furnace, or producer itself, the better, and that the furnace should be made as large as is permitted by the space at the disposal of the designer. This is not correct, since, if the rate of combustion of fuel per unit of area is too low, the proper temperature for the production of carbon dioxide cannot be obtained, and the producer gas passing off from the furnace will contain too large a proportion of this inert constituent.

Experience has shown that it is not well to have the grate area any larger than is determined by the rule that, under normal operation, 8 lbs. of fuel should be consumed or gasified per hour per square foot of area. This is the rule which is followed for individual producers employed to heat single benches of retorts. In the case of outside producers—such as are used in some large works to heat several benches of retorts, and also to furnish producer gas for use in various industries or for the production of power—the grate area is usually proportioned on the basis of the gasification of from 16 to 24 lbs. of fuel per hour per square foot of area. The objection to a high rate of gasification per square foot of area is that the higher the rate the greater the tendency to clinker troubles. This tendency, however, is not serious with the ordinary retort-bench furnace when properly handled, if the rate of gasification does not run above 10 to 12 lbs. per hour per square foot.

IRON v. STEEL FOR GASHOLDER CONSTRUCTION.

In view of the interest which has lately been aroused in the subject of the material for the construction of gasholders and their tanks by the report of Mr. A. G. Drury, M.Inst.C.E., on the Ilkeston disaster, given in the "Journal" last week, attention may be called to a short paper read by Mr. G. F. Ahlbrandt, of Middletown (Ohio), at the last meeting of the American Gas Institute, and contained in the volume of "Transactions."

The author explained at the outset that the purpose of his paper was to show the difference in the manufacture of iron as compared with steel, to develop the real cause of corrosion, and to show why pure iron can be made to advantage for gasholder construction. He then proceeded as follows: When steel is made in an open-hearth furnace, the metal is tapped as soon as the charge is in the molten state, and when the carbon is worked out to the required point. While this molten metal is running into the ladle, a recarborizer is added, consisting of carbon, manganese, phosphorus, &c., in order to make it more workable, and to be of a definite chemical composition. The time required to manufacture 50 tons of steel is from seven to ten hours. When pure iron is made in an open-hearth furnace, the purification stage just commences when the charge is in the molten state. The manufacture of this pure iron is a process of elimination from start to finish. Not only are the sulphur, phosphorus, carbon, manganese, and silicon eliminated, but also the gases, such as oxygen, hydrogen, and nitrogen, are reduced to a minimum. When the pure iron is tapped, no recarborizer is added—in fact, nothing but a small quantity of deoxidizer, which simply absorbs the last traces of oxygen and other gases that might be absorbed by the iron. The time required to manufacture 50 tons of this iron is from ten to fifteen hours. The principal difference between the manufacture of steel and iron is, therefore, the omission of the very intense purification stage, the addition of a recarborizer, and the increased output in a given time. Let us see what part this plays in the life of steel against pure iron.

The mass of evidence which has been presented to us would prove, if we had time to consider it, that "corrosion is due to an electrolytic action, and that the electrolytic theory is upon firm, solid ground." This theory demands the elimination of those impurities which differ electro-chemically from the base metal. Further, the evidence proves conclusively that the essence of the problem of rust resistance depends most emphatically upon the purity of the iron, not only as it relates to sulphur, phosphorus, carbon, manganese, and silicon, but also to copper, slag, oxygen, hydrogen, and nitrogen contents. These are the impurities that set up positive and negative poles throughout the material, thus accelerating corrosion and causing pitting.

The electrolytic theory simplified is as follows: The action that takes place in the corrosion of iron or steel can be compared to that which occurs in an ordinary telephone battery. In this the zinc is always eaten away and deposited on the copper, because there is a difference of "potentiality." Applying this theory to iron and steel, the impurities in iron and steel and the pure metal act towards each other just as zinc and copper do in the telephone battery. In damp weather, a current is set up between the pure iron and the impurities because of their difference in potential; and the one is eaten away and deposited on the other. This action continues indefinitely until the material has been corroded. Hence, to overcome this action, it is absolutely essential that the impurities should be eliminated, and the sheet be homogeneous throughout.

We see from the foregoing that all the impurities in iron or steel tend to accelerate corrosion more or less; and hence it is absolutely necessary to use a pure iron if we are interested in durability. By removing the gases as well as the metalloids, we prevent pitting and tubercular corrosion. We find that "the purer the iron, the greater will it resist corrosion."

The author proceeded, by the aid of illustrations, to examine the durability of iron as compared with steel. A test fence was erected in Atlantic City in 1908, by the American Society for Testing Materials; and the value of pure iron over steel from the standpoint of durability and rust resistance was proved beyond question. The conclusion he came to was that, according to the evidence, pure iron plates should be used instead of steel for the erection of gasholders, though he acknowledged that the former cost 30 per cent. more than the latter.

SCOTTISH JUNIOR GAS ASSOCIATION.

Visit to the Stirling Gas-Works.

The members of the Eastern and Western District Divisions of the Scottish Junior Gas Association paid a visit to the Stirling Gas-Works on Saturday, the 22nd ult. The features of the works [the carbonizing plant at which was described in the "Journal" in connection with the meeting of the North British Association in 1909] were explained to the visitors by Mr. J. M. Smith, the Engineer and Manager, and Mr. Stewart, the foreman. The inspection proved enjoyable in every way; and there were many complimentary remarks upon the compactness and smooth working of the establishment, with recognition of the value of the close proximity of the site to the railway.

Since 1910, 32 retorts have been added on the same horizontal principle as the previous installation—bringing up the present total to 112 retorts. The effectiveness of the Dempster and Toogood mechanical stoking apparatus, for both charging and discharging, was generally appreciated. The coal is never touched by hand from the time it goes into the works until it is delivered as coke into the waggons on the adjoining high-level rail, by means of a coke-hoist, which includes screening plant.

At the conclusion of the visit, the members were entertained at tea in the Waverley Hotel—Mr. George Kinross, the Chairman of the Gas Company, presiding.

Mr. Kinross, on behalf of the Directors, expressed their pleasure at seeing their visitors and putting the works at their disposal. He might say that these had been progressive since they had the unfortunate dispute with the Town Council about taking them over. The manufacture of gas had gone up steadily every year, until it was now considerably more than double what it was at that time.

Mr. F. L. MacLaren (Dumbarton), the President of the Western District Division of the Association, in thanking the Directors, remarked that everything the members had seen was the very best of its kind.

Mr. W. Geddes (Granton), the Vice-President of the Eastern District Division, thanked both Mr. Smith and Mr. Stewart for their courtesy in showing the visitors round the works.

In reply, Mr. Smith said the works were not on a large scale, but, on the system after which they were designed, they were quite up-to-date. Everything had worked satisfactorily, and the Company was in a good position.

Mr. Alex. Wilson, the Gas Engineer and Manager to the Glasgow Corporation, speaking on behalf of the older school of gas managers, remarked that he had enjoyed the visit very much. He had not been in the works for more than twenty years; and he did not think he could find a better example of the progress of gas manufacture than in comparing his former visit with that which he had just paid. He thought Mr. Smith and the Directors deserved the greatest credit for the condition of their works, and in having up-to-date plant, with all the best facilities for keeping it in order.

Electric Light Carbons from Tar.—According to a paragraph in the "Scientific American" [Vol. CVII., p. 477], high-grade carbons can now be obtained from tar, by a process invented in Sweden. The method depends on the fact that finely-divided carbon forms a large percentage of tar, as the black colour is due to carbon particles suspended in an otherwise dense and transparent yellowish-brown liquid. By this process the carbon can be separated from the liquid, and can then be moulded into any desired shape. The powdered carbon can be pressed to form electric light carbons or into larger sizes for electrodes.

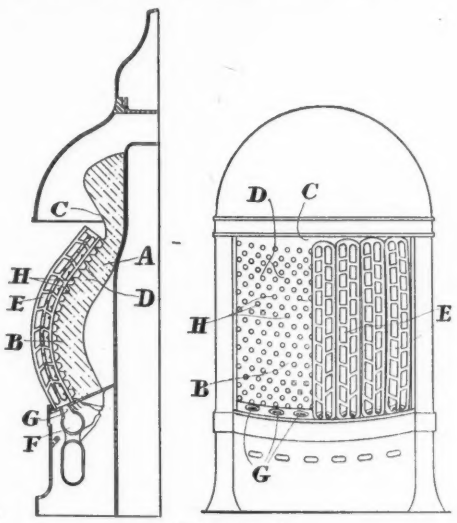
REGISTER OF PATENTS.

Gas-Fires.

HARRIS, R. P., of the Commercial Gas Company, Stepney.

No. 13,173; June 4, 1912.

This invention comprises a construction of gas-fire whereby, it is said, a larger amount of heat is radiated into the room.



Harris's Gas-Fire.

The gas-fire, as shown, comprises a fire-clay back A, which curves outwardly and upwardly from the base into the bulging portion B, which then curves rearwardly and merges into an upper concave portion C at D. "Fuel tubes" E are arranged in front of the block A, and are shaped to correspond with it. These tubes may terminate at the part D, in which case they are formed with a single bend as shown; or they may extend up to the part C, in which case they have a double bend. The tubes rest against the back, being spaced slightly therefrom by projections H, which may be formed at about the part D or all over the back, as shown. Beneath the tubes is arranged a burner F, inclined so that the nozzles G project directly into the tubes. When the fire is in use, the flames from the nozzles are projected into the tubes and travel around the part B of the block, "whereby a larger amount of heat is radiated into the room."

Gasholder Guides.

LÖHLE, K., of Zürich, Switzerland.

No. 9276; April 19, 1912.

In the course of his specification the patentee remarks: All the rollers of a gasholder guide must be dimensioned for the maximum pressure that may occur in the ring of rollers. It is therefore advantageous to design a ring of rollers with only a small number of rollers. In a radial guide it has been found by experience that the distance between one roller and the next must not be much greater than 26 feet, because otherwise the pressure of the wind may produce dangerous deformations of the bell and the telescoping sections. A reduction in the number of rollers, and the consequent increase of their horizontal spacing, is allowable only where it is possible to stiffen the bell and the telescoping sections sufficiently in the horizontal direction. A tangential gasholder guide requires a very much smaller number of rollers in a ring of rollers than does a radial guide; while it affords greater advantages in the construction of the guide framing than a radial guide. Its proper operation necessitates, however, an effective horizontal stiffening of the telescoping sections of the bell.

The present invention has for its object to produce a horizontal stiffening of the movable parts of the gasholder which will be sufficient for the purposes named; and one application of the invention is illustrated by the patentee.

Fig. 1 is a vertical section of a detail. Fig. 2 is a plan. Fig. 3 is a partial vertical section of a holder embodying the improvements referred to. Fig. 4 is a horizontal cross-section on the line I. II. of fig. 3 (to a smaller scale). Figs. 5, 6, and 7 are details of one guide. Figs. 8, 9, and 10 illustrate another application of the stiffening arrangement—a partial vertical section, a horizontal cross-section on the line III., IV., of fig. 8, and a partial diagrammatic plan.

As shown in fig. 1, A is the bottom trough of a telescoping section of a gasholder bell, and B is the upper trough of the next lower telescoping section. It is stiffened by a horizontal outwardly extending lattice girder C. The U-bar C^1 of the trough is utilized to form the inner flange of this stiffening girder; while the outer flange may be curved to an arc of a circle, or it may be polygonal. On its outer side it carries a guide roller C^2, which (in the case of a tangential guide as figs. 1 and 2) runs in a U-bar fixed on the guide framing.

By suitably choosing the distance of the outer flange from the upper trough and the cross sectional dimensions of the flange, it is possible (the patentee points out) to reduce the deformation caused by the wind pressure to any desired small amount.

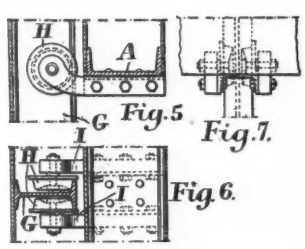
The guide framing differs from the ordinary construction in that its diameter must be greater than the internal diameter of the tank by approximately the depth of the lowest horizontal girder (fig. 3). But this drawback may be remedied to a partial extent, if necessary, by arranging the uprights of the framing in the lower panel obliquely, as indicated in the dash-and-dot lines.

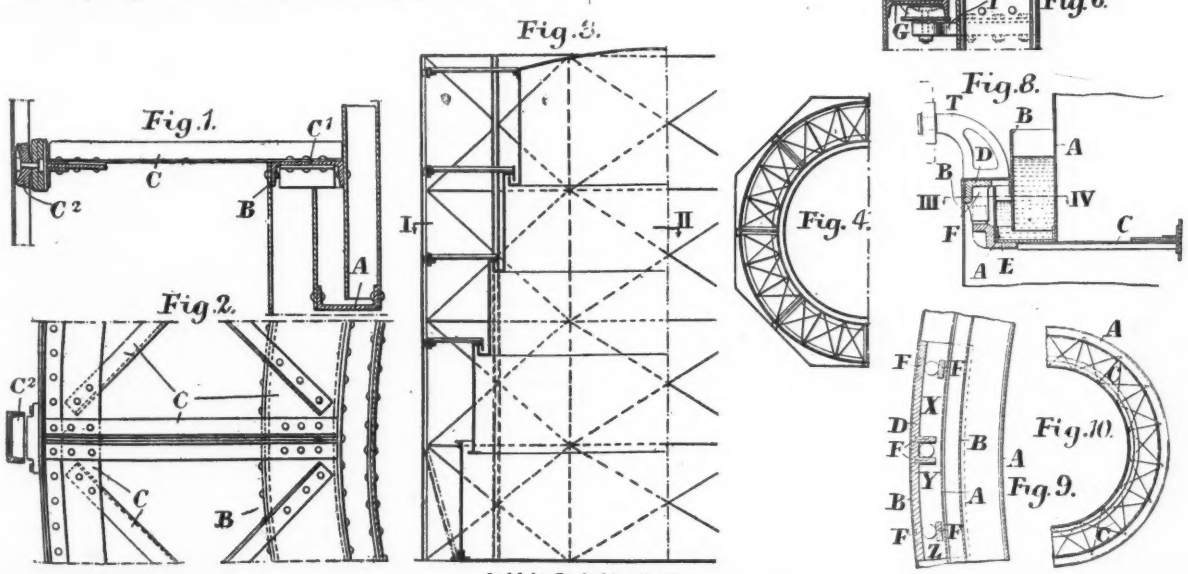
The lower trough is guided by the telescoping section of the upper trough so as to exclude inward bending; and a guiding of this kind is shown in figs. 5, 6, and 7. The outer telescoping section carries on its inner side I-girders G, on the inner sides of which work rollers H, mounted on the lower trough A, each by means of an arm I.

Another construction for the purpose of stiffening the telescoping sections is shown in figs. 8, 9, and 10. Here A is the lower trough of a telescoping section of the holder; and B is the upper trough of the next outer telescoping section. The lower trough is stiffened by a horizontal and inwardly extending lattice girder C. The U-bar of the trough is utilized as the outer flange of this stiffening girder. By suitably selecting the distance between the flanges and cross sections of the flanges, it is possible also in this case to reduce to any desired small amount the deformation caused by the wind pressure.

The roller bracket T is fixed to the upper trough B. It also forms the support for the stiffening girder C that is provided on the lower trough. By this means there is formed between the roller bracket and the stiffening girder a connection which, when the holder is full of gas, is capable of transmitting the roller pressure to the stiffening girder, and is also capable of becoming disconnected "with the least possible frictional resistance when the lower trough moves down to the next lower upper trough when the holder is being emptied."

This connection may have the construction shown. To the outer flange of the stiffening girder—that is to say, to the U-bar of the lower trough A (fig. 8)—there is attached a casting E, which engages in such a manner in a second casting F, fixed to the upper trough B, that the





Lohle's Gasholder Guides.

roller pressure and the moment of the roller pressure due to the eccentricity are transmitted from the latter casting to the former casting.

These castings engage each other at three points X Y Z in such a manner that no shifting of the lower trough relatively to the upper trough is possible either in a tangential direction in one of the three points—for instance, in X—or in a radial direction in the two other points Y Z.

The two arrangements may also be combined together. Thus the upper troughs may be stiffened by outwardly extending lattice girders, and the lower troughs by inwardly extending lattice girders. In such a case the disconnectable connection of the upper and lower troughs which is shown in figs. 8 and 9 and also the guides shown in figs. 5, 6, and 7 may be omitted.

The lattice girders may be inclined instead of horizontal; "but the latter arrangement is preferable for constructional reasons."

Constructing Retort-Settings.

PARKER, G. W., of St. Louis, Missouri, U.S.A.

No. 18,354; Aug. 9, 1912.

The main object of this invention (in the words of the patentee) is "to provide a method of constructing a retort-setting that embraces the retorts so snugly that there is no possibility of the retorts sagging or cracking after the furnace has been in operation for a short period." And another object is "to provide a method which makes it possible to build a retort-setting of the character described cheaply and with unskilled labour."

Briefly stated, the invention consists in arranging a retort in position and then moulding refractory material around a section of the retort so as to form a setting or wall through which the retort passes. The inventor prefers to use silica, and also provide each vertical partition wall of the setting with expansion joints so as to provide for the expansion of the silica when it becomes heated. He illustrates a coal-gas bench constructed in accordance with his invention; but does not wish it to be understood that the invention is limited to a method of constructing the setting of a gas-retort furnace, "for the broad idea is applicable to any kind of a retort-furnace in which the retorts are set or mounted in a refractory supporting structure."

Fig. 1 is a front elevation partly in transverse vertical section. Fig. 2 is a longitudinal vertical section. Fig. 3 is a perspective view illustrating the method of constructing the vertical partition walls which constitute the setting for the retorts. Fig. 4 is a vertical longitudinal section of a bench of inclined retorts.

In figs. 1 and 2, the setting for the retorts consists of a number of vertically disposed partition walls that extend transversely of the retort chamber and are provided with aligning openings or spaces A, which form openings through which the products of combustion travel, and which enable the operator to inspect the temperature of the setting

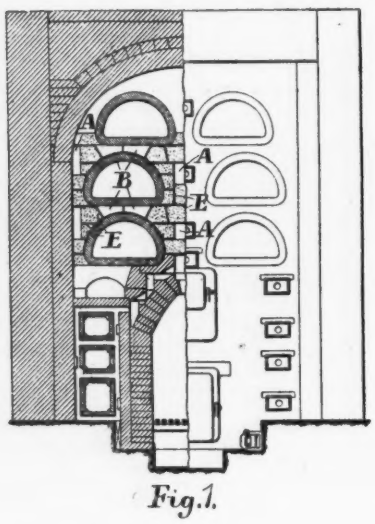


Fig. 1.

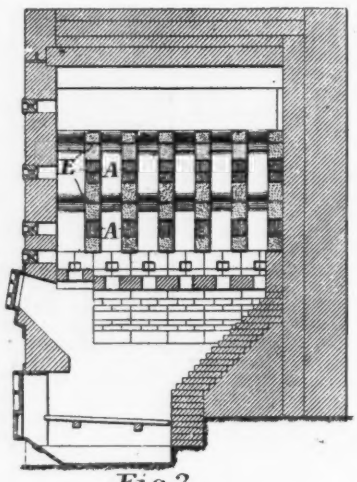


Fig. 2.

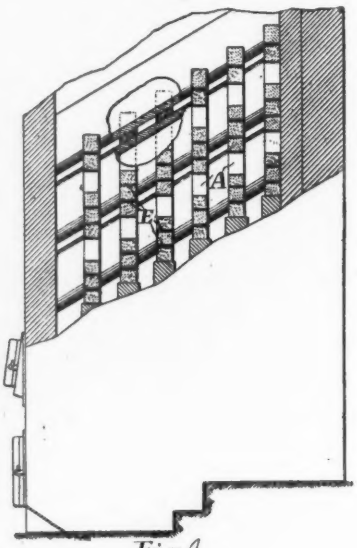


Fig. 4.

Parker's Retort-Setting.

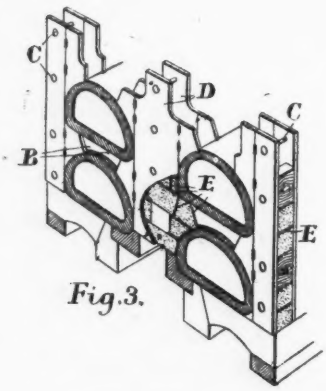


Fig. 3.

from front to rear. The partition walls are formed from refractory material moulded around the retorts in forms that are removed or burned out after the material has set or hardened. It is preferred to build up the partitions progressively—namely, first build the lower portions of the partitions around the retorts of the bottom horizontal tier; then arrange the retorts of the second tier in position, and build the partitions up around the retorts; and so on, until the partitions have been carried up to the proper height on the uppermost tier of retorts. It is also preferred to arrange spacing blocks B between the superimposed retorts, so that the partition walls will not be subjected to the weight of the retorts while in a plastic or semi-plastic state.

Any kind of form can be used for moulding the material from which the vertical partition walls are made, but the patentee prefers to use forms which are so constructed that they can be collapsed and removed easily; or else the forms can be left in position so that they will be burned out when the furnace is fired. As shown in fig. 3, the form for each partition wall consists of two vertically disposed parallel walls that are spaced-away from each other a distance equal to the thickness of the finished partition wall. The form is provided with openings through which the retorts pass; and the front and rear walls of the form are tied together by removable bolts or other fastening devices C, some of which pass through filler blocks arranged inside the form, so as to form the spaces A in the partition wall through which the fire gases travel. Each vertical wall of the form comprises a centre member D provided with hinged wings that conform to the shape of the retorts and lap over them; while two side members are provided with hinged wings that conform to the shape of the retorts and lap over them, as in fig. 3.

After the retorts of the bottom tier have been arranged in position and the forms erected, refractory material in a plastic condition is poured in and tamped well, so as to cause the material to pack together. If silica is used, it is preferable to provide the partition walls with expansion joints by embedding strips of cardboard E in the plastic material. After the lower portions of the partition walls have been formed, the retorts of the second horizontal tier are arranged in position, and more plastic material is introduced into the forms, so as to carry the moulded walls up to the top of the second tier of retorts—these operations being repeated until the partition walls are carried up to the proper height around the retorts of the top tier. After the material has hardened, a small fire in the furnace chamber will drive the moisture out of the material, and thereafter the forms are removed and the furnace is fired up so as to subject the partition walls to a sufficient degree of heat to burn the material from which they are formed, and also destroy the strips of pasteboard embedded in the walls.

From the foregoing, it will be seen (says the patentee) that there is no liability of the retorts of a furnace of the construction described sagging and cracking, because the setting of refractory material which supports the retorts snugly embraces each retort and completely surrounds it. Furthermore, this method of constructing a retort-setting "overcomes the necessity of using high-priced blocks of special shapes and sizes, it eliminates waste of material, and it overcomes the necessity of using high-priced skilled labour, as only workmen of ordinary skill are required to pour the material into the forms and tamp it properly.

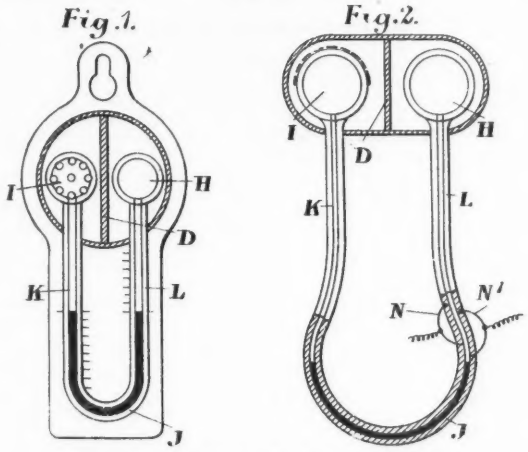
Indicating the Quantity of Inflammable Gases in the Atmosphere.

GUASCO, A., of Paris.

No. 3628; Feb. 13, 1912.

This invention is based upon the known property of certain metals (platinum sponge and the like) of condensing gases—such as carbonic oxide, light carburetted hydrogen, or firedamp—and liberating heat. The heat produced being proportionate to the quantity of gas condensed, it follows that a temperature indicator subjected to the action

of a catalytic metal will reveal the presence of the gases in the atmosphere in a manner proportionate to their quantity. Proceeding from this principle, toxico-metric apparatus can be devised which measures at any moment the quantity of deleterious gases introduced into the atmosphere irrespective of the surrounding temperature of these appliances.



Guasco's Indicator for the Presence of Gases.

The apparatus shown in fig. 1 is formed by two glass or metal bulbs H I united by a tube J containing a certain quantity of liquid, the level of which is the same for the two branches K L, which, together with the bulbs H I, are exactly similar in volume. The bulb H is an ordinary glass or bare metal bulb; while the bulb I carries platinum sponge or fragments of catalytic metal or alloy. The two bulbs are enclosed in an insulating box (wood, ebonite fibre, or the like) with a wall of asbestos or other porous material permitting of endosmose in order to facilitate the passage of the gases and their separation from the air. The gases thus separated contact with the platinized bulb I, and "this method renders the apparatus much more sensitive than if gas mixed with air came into contact with the bulb I."

If gas is contained in the medium in which the apparatus is placed, the air contained in the bulb H will remain at the temperature of the medium in which it is enclosed, while the bulb I, which carries (say) platinum sponge, rapidly assumes a higher temperature. The air contained in this bulb becomes heated, destroys the equilibrium of the two columns, and, in expanding, forces the liquid column from the branch K into the branch L to a greater or less extent, according to the quantity of gases existing in the medium in which the apparatus is immersed. The difference of level of the liquid between the branch K and the branch L will be relatively large, because for a displacement of 2 mm. of the liquid contained in the branch the difference of level between the branch K and the branch L will be 4 mm.

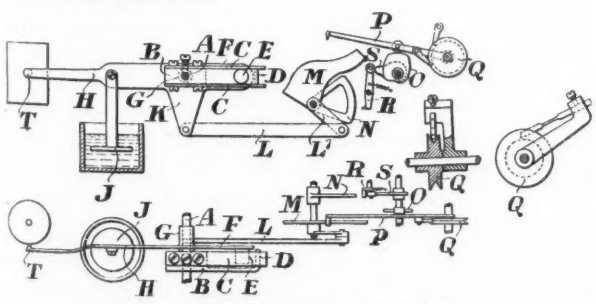
The apparatus described can be utilized as an "annunciator," as shown in fig. 2. Here the level of the liquid is the same in both branches of the U-tube, and there are arranged in the branch L (the volume of which is the same as that of the branch K) two wires N and N^1 with which the liquid ascending in the branch L will come into contact under the influence of the expansion produced by the heat of the bulb I covered with catalytic metal, when inflammable gases are contained in the space in which the apparatus is arranged. The circuit is thus closed—actuating an annunciator bell.

Integrating and Recording Mechanism for Use with Rate-of-Flow Meters.

HODGSON, J. L., of High Holborn, W.C.

No. 22,370; Oct. 1, 1912.

The patentee remarks that in meters which measure the flow by means of the fall in pressure across a Venturi tube, orifice, Pitot tube, or the like, or by means of the motion of suitably shaped and guided obstructions placed in the pipe line, a movement is obtained which is a measure of the flow passing; and his present object is to provide improved mechanism for enabling this movement to be used as the basis of a counter record.



Hodgson's Rate-of-Flow Meter Attachment.

A side elevation and plan are given of the mechanism constructed in accordance with the invention.

The movement which is a measure of the flow causes the shaft A to rotate through a small angle. To the shaft is keyed an attachment B carrying two springs C, which press against a distance-piece D. In between the springs lies a pin E, carried by an arm F on a sleeve G loose on the shaft A. This sleeve has fast with it an arm H, to which is attached a dashpot piston J, and also a crank-arm K.

If the flow is pulsating, the attachment B follows the pulsations, but the crank-arm K is driven through the flexible transmission, and is damped by the dashpot piston J, and therefore responds slowly.

To the crank arm K is attached, either directly or through a connecting rod L and an arm, a cam M, fast with which is a brake surface N. At given intervals, a cam O causes a feeler P to move from a zero position on to the surface of the cam M and back again. As the feeler descends, it drives, by means of a pawl, a ratchet Q, which is fast on the spindle of the counter train. The movements of the feeler are thus added on to the counter train; while there is a pawl preventing the rotation of the ratchet in the wrong direction.

In order that the pressure of the feeler upon the steep surface of the cam M shall not be able to displace it, and also to prevent any movements of the cam (while the feeler is in contact with it) causing an improper rotation of the ratchet Q, the cam spindle is locked by means of a brake R, which is pressed against the brake surface N by a spring as the feeler begins to descend. If any sudden change in flow occurs while the cam is thus locked, the springs C allow the shaft A to take up its new position without strain on the mechanism. The brake R is removed from the surface N at the end of the motion by a subsidiary cam S, so that the cam M is free to take up any new position between the integrations.

If the motion of A is approximately proportional to the square root of the quantity to be integrated, the arm of the connecting rod L may be put at a steep angle in the initial position, or the transmission links may be so modified as to magnify the motion of the cam M at the low flows. This reduces the steepness of the cam and "enables accurate integration to be effected over a larger range of flow."

If a diagrammatic record of the flow is desired, a pen T may be attached either to the arm F or to the arm H as shown; the cam M and the integrating mechanism being omitted if desired.

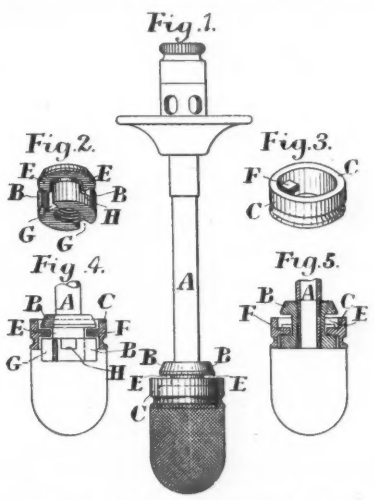
The enlarged side view and section show a preferred form of pawl and wheel Q. The latter is not provided with teeth, but has a deep and steeply walled groove cut in it in which lies a pawl formed of wire, as shown; or a pivoted pawl may be employed in conjunction with such a groove.

Attaching and Locking in Position Incandescent Mantles to Inverted Burners.

ARMYTAGE, W. K. L., of Horrabridge, South Devon, and LUCAS, J. S., of Poole, Dorset.

No. 13,998; June 15, 1912.

The object of this invention is to provide a locking device which renders more safe the act of securing the mantle—thus avoiding the risk of destroying the mantle during the locking operation, "which is constantly now the case"—and likewise maintain the true pendant position. The locking of the mantle takes place by means of projections entering an annular recess and being moved into locking recesses leading off from the annular recess. The mantle ring is without legs or feet projecting either outwardly or internally from the top.



Armytage and Lucas's Mantle Attachment to Inverted Burners.

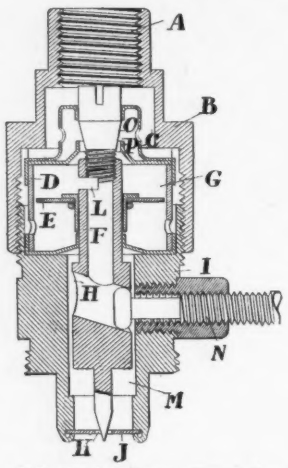
A is the burner-tube, and B the fitment or attachment device secured to the burner-tube. The device is provided with an annular recess or path E; and projections F (fig. 3) in the mantle-ring C are adapted to be passed into this annular recess by means of admission grooves or entrance slots G, so that the projections may be passed up into the recess E and turned round. Below the recess, and preferably at right angles to the position of the entrance slots G, are the second recesses H, into which the projecting lugs F enter by lowering the mantle-ring when it has been turned sufficiently to bring the projections opposite the recesses. The projecting lugs are secure in their recesses H, and cannot become displaced by vibration or otherwise. Except for the entrance slots G, the projecting lugs F are safe within the recess E, even if the mantle-ring is released before the projections are properly seated in their recesses H. Consequently, "such premature release of the mantle does not occasion its destruction, as is now the case with the present devices in use."

Regulating Nozzles for Gas-Burners.

EHRICH AND GRAETZ, of Berlin.

No. 19,845; Aug. 30, 1912. Convention date, March 28, 1912.

The object of this invention is to provide a regulating nozzle with a fitted pressure regulator which operates with a piston, but wherein, simultaneously with the alteration of the outlet orifice of the nozzle relating to the burner, the difference in the pressures acting upon the piston is affected in such a way that the piston (however large the outlet orifice relatively to the nozzle is made) always maintains the pressure obtaining immediately before the adjustment, at the same predetermined level.



Ehrich and Graetz Gas-Burner Regulating Nozzles.

In the arrangement shown, the gas enters through the screwed socket A in the nozzle, and passes partly between the cap B on the one hand and the hood C and the tube D on the other hand; and it thence flows through holes in the tube into the space beneath the piston E. The piston (fitted with play in the tube) is formed with a cylindrical guiding sleeve which slides loosely upon the tube F—a split ring or the like connecting the sleeve and the piston together. There exists therefore beneath the piston the full gas pressure obtaining in the main. From the socket A the gas also passes through holes beneath the hood C, and thence into the space G above the piston. From here the gas flows further through an opening into the tube F and thence into the space H in the body I, finally passing into the space above the nozzle-plate J. From there it flows through the orifice K to the burner.

The annular space in the upper part of B is so adjusted that a slight throttling of the gas takes place. The gas, therefore, flows from the space G with greater velocity than that with which it can enter. So that there thus results in the space a gas pressure which is somewhat less than that in the space below. The piston E is therefore raised, and closes the orifice L, thereby more or less cutting off the supply of gas to the space M. By suitably choosing the individual dimensions, the piston can regulate the orifice L so that, whatever pressure passes through the socket A, the pressure in the space M is retained at a constant level.

If, now, the consumption of the burner be altered—for example, by reason of the incandescent body being changed—then the regulating pin is raised or lowered by the regulating screw N. At the same time, however, the cone O rises or sinks and widens or narrows the annular space existing between it and the cover. The conicity of the body O is "thus so proportioned relatively to the pointing of the pin, that at all positions of the latter the same pressure is practically always given by the piston."

If, for example, the regulating pin be raised, the cone O is likewise raised, and the space between O and P is increased. There is thus somewhat more gas admitted to the chamber G corresponding to the larger quantity of gas flowing through the orifice K. It is to be noted, however, that the widening of the orifice K need not be in proportion to the increase in the space between the parts O and P. The space between must rather be so regulated that the piston is subject to the correct pressure in order to close the opening L to such an extent that the correct pressure is obtained in the space M, even under the altered conditions.

APPLICATIONS FOR LETTERS PATENT.

6502.—HARPER, J., AND CO., LTD., and RETALLACK, C., "Gas stoves and heaters." March 17.

6503.—SMITH, E., "Generating acetylene." March 17.

6567.—WHITING, F. O., "Handling coal." March 17.

6588.—HILTON, J., "Joints for pipes." March 17.

6635.—EPSTEIN, G. J., "Fuel and bye-products." March 18.

6763.—PEGLER, B. C. H., "Gas-cocks." March 19.

6803.—GIBBS, R. R., "Taps or cocks." March 19.

6825.—WALLWIN, J. M., "Burners." March 19.

6877.—FEATHERSTONE, W. B., and POTTER, W. J., "Production of coal and other gas, tar, ammoniacal and other liquor, and smokeless fuel." March 20.

6917.—CHEMISCHE INDUSTRIE AKT.-GES. and SINGER, L., "Automatic charging apparatus." March 20.

6954.—CROSSLEY, M. E., "Holding mantle-rods." March 22.

6959.—ZIEHAUS, G., "Centrifugal governors." March 22.

7004.—SMITH, T. W., "Valve-couplings for pipes." March 22.

7014.—DUCKHAM, A. M'D., "Coking of coals or other bituminous material." March 22.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The Abandoned Coal Export Tax.

SIR,—The extract from the report of the "Royal Commission on Coal Supplies," which your correspondent, "Coal Fitter," has sent you, does not warrant the conclusion he draws from it. The Commission evidently found it difficult, when they came to frame their report, to reconcile all that was said before them in 1903 about lessened business resulting from the coal tax with the fact that, when the figure for that year came to be made up, "the export for the year 1903 was the highest ever recorded."

In dealing with the tax question in their report, they were careful to guard themselves by the statement that "the witnesses were generally of opinion," &c.; and if the list of the witnesses is referred to, the reason for those opinions is evident. It would take too long to deal exhaustively with this portion of the report; but the matter is put in a nutshell by one of them, Mr. W. E. Heatley, who said in evidence: "As regards Durham coals, the competition is not so severe, because the gas-works abroad are (like the gas-works at home) in a great measure compelled to use gas coal; and except in the districts where the Westphalian gas coal can be easily carried to, the gas coal from this country has a *quasi*-monopoly."

What is true of gas coal is also true of coke-making coal. The foreigner must have it; and my contention has been throughout that he should contribute something extra to the national reserve beyond the profit of the coal owner. What that something should be, I have not said. I believe he can well afford a shilling per ton. The figure of half-a-crown per ton was not my own, but that of a large coal exporter who ought to know.

CHARLES CARPENTER.

South Metropolitan Gas Company,
March 31, 1913.

Alliance and Dublin Consumers' Gas Company.

SIR,—There are several points on which I should like information from the Directors, arising out of the accounts, a copy of which (as a stockholder) I received on Easter Monday.

What is proposed to be done regarding the debit of £48,558, which presumably will now be between £50,000 and £60,000? The £60,000 raised by ordinary stock would, at about present market price, represent an annual dividend of £3900, or £1950 for the half year. For the past half year the dividend and interest represent £44,296 16s. 4d. This is not quite clear. Debentures issued to the 31st of December last represent £374,000 at 4 per cent., equal to £14,960, or £7480 for the half year, whereas the accounts only show £7043 13s. 6d., *plus* interest and commission, £719 11s. 7d. This should be explained.

The Company did not earn enough profit to meet interest and dividend by nearly £2500 during last half year. Such being the case, how is the dividend on new capital to be met, without increasing the price of gas or otherwise improving the efficiency of the business? The present stockholders are sufficiently penalized by the non-payment of the full statutory dividend, and it appears hopeless at present to prophesy when this blessing is likely to come. In view of the price paid for coal for the past six months, it points to a still higher figure for the coming year; and, if this is so, how do the Directors propose to meet this extra expense? as while residuals respond up to a point, they do not do so indefinitely. The extra cost of repairs on works, £2608, should also be explained.

There seems to be something wrong in the gas revenue. For the half year ended the 31st of December, 1911, the revenue from gas, other than public lighting and contracts, was £87,618 16s. 10d.; for 747,708,350 cubic feet. This last figure is stated in the revenue account, and no corresponding figure in the December, 1912, revenue account. For public lighting and contracts, the revenue for the same period was £7917 9s. 9d. Now for the past half year the sales of gas other than for public lighting and contracts show an increase of 8,621,000 cubic feet; while the revenue is £3148 17s. 3d. less. Public lighting and contracts show an increase of 2,484,000 cubic feet; and the revenue is £365 0s. 11d. up. The total sales are, therefore, up for the half year 11,105,000 cubic feet (about 1½ per cent.), while the total gas revenue is down £2783 17s. 4d., and the price of gas has not been reduced. In the December (1911) half year balance-sheet, the figure of 747,708,350 cubic feet given in the revenue account is obviously wrong, as it is the figure given overleaf as the total quantity of gas accounted for. But apart from this, there is some serious discrepancy in the other figures in the gas revenue.

Why not utilize the £12,370 14s. 8d. and the £4147 16s. 3d. for wiping-off to that extent the balance in suspense, which would leave but £4563 17s. 6d.? At the present rate, it will be 1918 before the account for modernizing the retort-houses is cleared.

The balance of £37,460 2s. 4d. is applicable to dividends, against £40,205 12s. 10d.; and after the dividend is paid, £1226 11s. 1d. is carried forward. This is a pretty state of affairs having regard to the nearly £50,000 to the debit of capital, and nearly £40,000 overdrawn at the bank! Will the Company ever get out of the bottomless rut?

I received my copy of the accounts about 10 a.m. on Easter Monday. This only gives six clear days' notice of the stockholders' meeting, instead of fourteen days. No advertisement, to my knowledge, appeared in the London papers or the technical journals; and having regard to the fact that the Company are now dependent on British capital, I do not consider the arrangements regarding notice satisfactory or complying with the Statute.

NONULUS.

March 26, 1913.

[At the request of our correspondent, a copy of the above letter was sent last Thursday to the Chairman of the Company, Alderman W. F. Cotton, M.P., so as to enable him (should he see fit) to deal

with the criticism in the course of the speech he would be making at the half-yearly meeting of proprietors called for yesterday afternoon in Dublin.—ED. J.G.L.]

The Ilkeston Gasholder Disaster.

SIR,—The able and exhaustive report which Mr. Drury has presented to the Home Office, and your valuable "Editorial Notes" thereon, are so extremely important that they are certain to receive the careful consideration of those who, like ourselves, are interested in the construction of tanks and gasholders.

May we be permitted, however, to remark concerning the suggestion that contractors, when preparing competitive designs, diminish the factor of safety below what they would under other circumstances provide, that, so far as we are concerned, it has never been our practice, and we believe our reputation in respect to work of this kind justifies our disclaimer.

As to the details of spiral-guided holders, it is necessary to keep clearly in mind that fundamental differences exist in the way the stresses are received and distributed, as contrasted with column-guided holders.

In spiral-guided holders, the strains are exerted in a vertical direction—the sides of the gasholder and tank acting virtually as deep girders in resisting the stresses, and affording little or no flexibility; whereas in column-guided holders, the strains are transmitted through the curbs of the gasholder and to the guide-framing horizontally, in which direction both structures possess considerable elasticity, so that if abnormal pressure is brought to bear upon any one set of wheels, the general structure is capable, within certain limits, of accommodating itself thereto; and the undue pressure being thus distributed among the neighbouring wheels renders excessive stresses at any one point less likely.

This we believe to be a point of importance that should be regarded both in respect to design and to the manner in which such holders are adjusted and kept under observation.

SAML. CUTLER AND SONS, LIMITED.

39, *Victoria Street, S.W., March* 29, 1913.

The Board of Trade and the Gas Undertakings Returns.

In last week's "JOURNAL" (p. 805), reference was made to the length of time that elapsed this year in the publication by the Board of Trade of the Gas Undertakings Returns as compared with some recent issues; and a correspondent points out one possible reason for the trouble. He says: "The cause of the delay in the issue of the Board of Trade returns relating to gas undertakings is the refusal of the . . . company to give the figures of the amount of coke-oven gas purchased by them; and it would seem, from correspondence I have had with the Board, that the latter have no power to compel the furnishing of any information, and that the making of the return as a whole is purely voluntary on the part of gas undertakers."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills read a second time: Blyth and Cowpen Gas Bill, Heathfield and District Water Bill, and Pontypridd and Rhondda Joint Water Board Bill.

As the Slough Gas Company have inserted a clause in their new Bill to the effect that the extra 3d. they are allowed to charge in certain parts of the rural district shall cease when the revenue from these parts equals 10 per cent. on the capital outlay in main laying, and that the extra 3d. shall not be chargeable at Ditton, the Eton Rural District Council have withdrawn their petition against the Bill.

COVENTRY CORPORATION BILL.

HOUSE OF COMMONS COMMITTEE.—Thursday, March 27.

(*Before Mr.* HUGH LAW, *Chairman, Mr.* MOUNT, *Mr.* PONSONBY, *and Sir* CUTHBERT QUILTER.)

This Bill is of an "omnibus" character, and includes sections relating to gas, electricity, water, motor buses, &c. The gas clause was opposed by the Warwickshire County Council.

Mr. C. C. HUTCHINSON, K.C., and Mr. J. W. JEEVES appeared for the Corporation; and Mr. J. G. TALBOT, K.C., represented the Warwickshire County Council.

Mr. HUTCHINSON, in opening this portion of the Bill to-day, pointed out that the proposal in the Bill, *quâ* gas, is an extension of the area of supply, and is contained in clause 10, which reads as follows:—

> "The limits within which the Corporation may supply gas shall extend to, and include, the parishes of Binley, Keresley, Stoneleigh, Walsgrave-on-Sowe, and Willenhall, all in the county of Warwick, and so much of the parish of Wyken in the said county as is not within the parliamentary borough of Coventry, in addition to the limits of supply authorized by the Act of 1856 and the Act of 1898; and the Corporation may, for the purposes of such supply, exercise within those parishes the same powers as they are authorized to exercise under the Acts and Order relating to their gas undertaking within the limits authorized by the Act of 1856, and the Act of 1898."

The opposition of the Warwickshire County Council was really a clause opposition, as some further measure of protection was required to that granted under the general law.

Mr. TALBOT, interposing, said he claimed his opposition to be to the preamble of the Bill.

Mr. HUTCHINSON, continuing, said that the gas undertaking at Coventry had been in the hands of the Corporation ever since 1884; and from the commencement the Corporation had supplied outside their boundaries. So that, so far as the principle of the Bill was concerned—if there be any principle in it at all—for asking permission to extend the boundaries of gas supply, this had been recognized from the earliest Acts. In 1884, the Corporation purchased the undertaking of a Company, since when there had been extensions of the area, beyond the city boundary, supplied with gas. He merely mentioned this to show the Committee that he was now asking nothing new. Even the Corporation gas-works were situated outside the city. The daily make of gas was 5¾ million cubic feet. The undertaking was an exceedingly successful one. The profits for last year amounted to £24,000; the capital expenditure being about £500,000. Dealing with the County Council's petition, he said that apparently it was feared the Corporation might obtain powers to break-up main and other roads which would cause inconvenience to the county authority in carrying out their duties. The Corporation, however, already had powers to break-up the county roads for the purpose of carrying mains into those parts of their area of supply which were beyond the city boundary; and the same protection which the County Council at present had, and which was to be found in the Gas-Works Clauses Act—which he contended was ample—was given under the present Bill. At any rate, the nature of the extra protection desired was not indicated in the County Council's petition, and he did not know what it was.

Mr. *Fletcher W. Stevenson*, the Gas Engineer and General Manager to the Corporation, said that he had already been approached for a supply of gas by some of the outside districts scheduled in the Bill. As a fact, they were supplying in Willenhall, by permission of the county authority, although the Corporation had no parliamentary powers to do so. A supply was similarly being given in Walsgrave-on-Sowe. In Willenhall, there were 400 yards of mains; and in Walsgrave, 300 yards. Applications had also been received for a supply of gas from residents in Keresley, which parish, as a matter of fact, was completely surrounded by other districts now supplied by the Corporation. There had also been applications for further mains extensions in Walsgrave; but the matter had been left over pending a decision on this Bill. Other parishes had also approached the Corporation from time to time. There was ample plant at the gas-works for the needs of the districts now desired to be added to the area of supply.

Mr. TALBOT'S cross-examination went to the point that there was no demand worth speaking of in the proposed additional areas; but he gave no indication of the nature of the protection he desired. He obtained from witness the fact that, although asked, none of the local authorities in question had actually given their consent to the Corporation's proposal to supply in their districts.

In re-examination, however, it was pointed out that, on the other hand, none of the local authorities were opposing the Bill, and that their refusal to give consent was doubtless at the instigation of the County Council.

The Committee adjourned until yesterday (Monday).

PONTYPRIDD AND RHONDDA JOINT WATER BOARD BILL.

This Bill has been before the Court of Referees—Mr. J. H. WHITLEY presiding—on the question of the *locus standi* of the Aberdare Urban District Council and the Neath Rural District Council to oppose the Bill.

Mr. HUTCHINSON, K.C., appeared on behalf of the Aberdare Council, who asked for *locus* on the ground that by the Bill the promoters sought an extension of time for the construction of new works, for which they had already obtained powers; and in the opinion of the petitioners there was no necessity for such extension, as the proposed works, which included the laying of water-mains through the Aberdare district, were no longer required. Counsel also based the claim of the Council on the ground that their tramways were affected by the new change of circumstances that had arisen.

The Court declined to allow the *locus*.

Mr. WEDDERBURN, K.C., for the Neath Rural District Council, said the Merthyr Tydfil Corporation had been granted power to make a reservoir for themselves; and in the Bill the Water Board proposed to get a large supply of water from Merthyr.

After hearing Counsel for the promoters, the Chairman said the Court had decided not to allow the *locus*.

Penistone and District Gas Supply.—The application of the Penistone, Thurlston, and Oxspring Gas Company for a Provisional Order to extend their powers of supply and increase their capital, was the subject of a Board of Trade inquiry at Penistone on Friday. Opposition was offered by local district and parish councils. The Company was established in 1858, with an authorized capital of £10,000 in £20 shares. The standard price for gas was fixed at 6s. per 1000 cubic feet. Power to borrow a fourth of the capital was granted. The additional £8300 required was, it was stated, for extra works. The Inspector will report in due course.

Redditch Gas Company.—At the recent annual meeting of this Company, the Chairman, Mr. Leslie E. Clift, reported an increase of 26½ million cubic feet (equal to 23½ per cent.) in the gas made, while the gas unaccounted for had been reduced to 2·58 per cent. The gross profit on the revenue account, after providing £3595 for depreciation and plant discarded, was £5797; and the amount available for distribution, including £1000 brought forward, £3154. A final dividend on the ordinary stock was declared for the second half of last year at the rate of 6 per cent.—making 5½ per cent. for the year. It was resolved to write off the sum of £683, the balance of the cost of the Provisional Order, and to carry forward £1200.

MISCELLANEOUS NEWS.

VERTICAL RETORTS FOR WEST BROMWICH.

The Local Government Board have sanctioned the borrowing by the Corporation of West Bromwich of £11,500 for an installation of vertical retorts—repayment to be spread over a period of twelve years. The Gas Committee have had under consideration the question of putting up an additional two settings at the same time as the three sanctioned on the 6th of November last. All the advantages which were brought before them then would also, they state, apply to the two settings it was proposed to instal; but there would be further marked advantages. In the first place, the capital expenditure on the additional settings would be considerably less in proportion to that on the three original settings; the same retort-house would accommodate the complete unit, which would be capable of producing 1¼ million cubic feet of gas per day; and the same machinery and plant would be necessary for the three as for the five settings. The working costs would therefore be reduced in proportion. Further, owing to the condition of some of the existing horizontal retorts and to the increased cost of materials, the expense of the ordinary annual repairs would be greater than was anticipated—viz., £600. If the two additional settings were installed at once, no expenditure on repairs would be necessary; the horizontal retorts being in sufficiently good condition to meet the maximum winter demand for gas for several years, without extensive repairs. The cost of the additional works would be £3740, which would mean an annual charge for interest and sinking fund, on a twelve-years period, of £413 per annum, which would be more than met by the additional saving in the cost of manufacturing gas.

The Committee have decided to proceed with the work, and also to make application to the Local Government Board for authority to borrow £3740. The work will be carried out by the Woodall-Duckham Company on their original tender for the extra settings, The two schemes will involve a total outlay of £15,240 on vertical retorts.

ITALIAN GAS COMPANY.

Directors' Report for the Year 1912.

The following are the principal portions of the report for the year 1912 of the Directors of the Italian Gas Company, supplying Turin, Bergamo, Tortona, Girgenti, and Venaria Reale. It was presented to the shareholders at the recent ordinary general meeting.

The year 1912 was considerably burdened by the effect of the unusual increase in the prices of coal, the continued critical condition of industry and commerce, and the competition of electricity. Nevertheless the accounts may be regarded as fairly satisfactory, considering that, with a slight decrease in the profits, we have been able to leave our reserve funds untouched. The following figures (cubic metres) show the quantity of gas sold in the past and the preceding year:—

	1911.	1912.	Increase.	Per Cent.
Turin	23,779,096	24,403,395	624,299 =	2·60
Bergamo	1,843,635	1,867,731	24,096 =	1·30
Tortona	460,973	463,984	3,011 =	0·60
Girgenti	472,656	541,765	69,109 =	14·50
Venaria Reale	*38,593	65,694	27,101 =	13·48
Totals	26,594,953	27,342,569	747,616 =	2·70

* Eight months only.

The increase in the sales in 1912 was maintained at all the stations; but there was a very considerable falling-off in the percentages of the increases compared with the previous year, with the exception of Girgenti and Venaria Reale. This can be easily explained. As regards Turin, there was the exhibition in 1911, and the consumption of gas was consequently greater; whereas last year there was a certain amount of unrest, and the price of gas was increased. At Bergamo and Tortona, the check was mainly due to the competition of electricity, which the Directors are, however, confident of successfully combating, as they have done on other occasions, by concentrating their attention upon the numerous ways of using gas for heating. Negotiations are in progress at Turin and Bergamo for renewals of the concessions. If these are successful, and the Company are granted a longer period, they will be able to extend their plant to the new districts in both these cities, and thus restore the normal increase in sales.

The demand for bye-products last year was very good, so that the prices realized were fairly satisfactory, notwithstanding competition. The Directors therefore gave special attention to this branch of the business, and effected constant improvement in the plant with a view to obtaining a maximum production of residuals.

The disturbances in the coal market were very great last year; and, in spite of the termination of the miners' strike in England, the prices of coal and the rates of freight reached hitherto unheard-of figures. The official average of the prices of gas coal, which in 1911 was 33·6 lire (26s. 10d.) at the works, was about 47 lire (38s. 9d.) last year; and the increased expenditure the Directors had to meet in this respect, compared with 1911, amounted to 910,000 lire for all stations. The increase of 2c. per cubic metre in the price of gas at Turin produced scarcely 489,000 lire. Consequently the difference of 421,000 lire had to be made up from other sources, and particularly by exercising economy in working. This was realized by the assiduous attention of the management at Turin and Bergamo.

In view of the necessity of regulating production according to consumption, which in 1911 had reached the maximum limit of capacity, of the works at Borgo Dora, the Directors had to apply to a European firm of specialists for the construction of additional retorts for a daily production of 20,000 cubic metres (706,000 cubic feet) of gas. These retorts, which are to be constructed in accordance with the most modern principles, will enable the Company to meet the demands upon them resulting from the extension of the municipal area of Turin, and the consequent increase in the number of buildings. The contract with the firm in question comprises the addition of a second set of retorts on more favourable terms than those which could be obtained with two different contracts, in the event of the plant proving inadequate during the next few years. Besides this important piece of work, the Directors are constructing a group of Sainte-Claire-Deville condensers to reduce the quantity of naphthalene in the gas. With regard to the distributing plant, the mains were lengthened last year by 18,200 metres (20,000 yards), and the house services, &c., increased as follows: New rising pipes fitted, 495; old fittings repaired, 87; branches made, 2207; gas-meters fixed, 4596—making the number of meters in use on Dec. 31, 50,765.

The Directors give a few particulars in regard to the improvement of the plant at the Bergamo, Tortona, and Girgenti stations, and conclude their report by saying they think it shows that, confident in the future of the gas industry, they do not hesitate to follow the path of progress, feeling sure of obtaining, from the capital invested, not only improvement of the works, but the return of the money during the period of the concessions.

The accounts accompanying the report show a net profit of 657,875 lire, which is a decrease of 107,835 lire as compared with the year 1911; and the Directors recommended the payment of a dividend of 7 lire per share, making, with 8 lire paid in October, 15 lire per share.

VERTICAL RETORTS FOR GREENOCK.

Report of the Corporation Deputation.

The members of the deputation appointed by the Greenock Corporation Gas Committee to deal with the question of vertical retorts having completed their inspection of plants at work in various gas-works, have reported as follows:

The following types of vertical retorts were seen—namely, the Wilson, the Woodall-Duckham, the Dempster continuous, the Dessau, the Glover-West, and also the chamber system; the last being more applicable to coke-oven practice. An installation of the Wilson system is in use, and was seen in Glasgow. The Woodall-Duckham system was inspected at the Kensal Green works of the Gaslight and Coke Company, London. It was also seen at Birmingham. The Dempster continuous system was seen at Hebden Bridge. The Dessau system was examined at Birmingham. The Glover-West system was seen at Bradford. The Helensburgh installation of Glover-West retorts was also inspected. After having inspected these various systems, your Committee is unanimously and strongly of the opinion that the vertical retort system is a remarkable advance on the horizontal method, and that it would be an immense gain to the Gas Department of Greenock to make the contemplated extension on this principle. We are also unanimously agreed that, in order to gain the full economy of the vertical retort principle at the earliest possible moment, tenders should be asked for a plant of two million cubic feet per day capacity.

We are thoroughly satisfied from what we saw that the following claims are justified:

1.—A gain of 1000 cubic feet of gas per ton of coal over our present results will be obtained.
2.—The absence of intricate machinery will render wear and tear and renewals inexpensive, and will minimize breakdowns.
3.—A very low fuel consumption for heating the retorts will be obtained (at least 25 per cent. less than our present fuel consumption).
4.—The yield of ammonia will be increased by at least 5 per cent.
5.—The coke produced is of excellent quality.
6.—Practically no naphthalene is produced. Therefore its consequent trouble of choked pipes will be avoided.
7.—There will be almost complete absence of smoke, steam, and dust in the retort-house; and practically no smoke will be sent into the atmosphere.
8.—Greatly improved and healthier conditions of working for the men employed will ensue.
9.—Lower working costs, as the quantity of coal handled per man will be increased.
10.—Greater regularity of output of gas will be ensured, with consequent increased efficiency of the purifying and condensing plant.
11.—A very large saving in the water used for quenching will be effected.

All these items together—viz., less coal required, less coke required to heat the retorts, decreased repairs, increased yield of ammonia, decreased work clearing stoppages, a considerably decreased water bill—make up a sum which it is certain would give 15 per cent. on the money invested. With the installation of the vertical retorts, combined with the work being done and proposed to be done on the mains, the supply of gas would be generally improved.

Your deputation therefore report strongly and unanimously in favour of going on at once with the extension of the carbonizing plant at Inchgreen on the vertical principle, and would advise that tenders should at once be asked for an installation on this system.

Bailie Taylor, the Convener, moved the adoption of the report at the Corporation meeting, which Mr. Paterson seconded. The motion was agreed to after discussion.

Electric Light Failure at Norwich.—The breaking down of a dynamo was the cause recently of an electric light failure at Norwich which caused some inconvenience. Fortunately, the cessation of the supply of current, which occurred shortly after ten o'clock in the evening, only lasted for a few minutes. The dynamo which gave rise to the trouble was, it was stated, one of those which were under water at the time of the great flood last year.

CONSOLIDATED GAS COMPANY OF NEW YORK.

Extracts from the Report for the Year 1912.

Recent issues of the "American Gaslight Journal" contained long extracts from the report of the Consolidated Gas Company of New York for the year ended Dec. 31 last. They furnished the following particulars in regard to the working of this important undertaking.

On the above-named date, the total assets of the Company amounted to $150,628,978, of which plant and property are returned at the value of $53,262,668; while bonds and stocks and advances to affiliated Companies are put down at $92,670,159. On the other hand, capital stock stands at $99,816,500; debentures and notes, at $8,738,100; accounts payable and accrued charges, at $5,588,334; stock and bond premiums, at $13,951,397; renewal and reserve, at $9,920,088; premium and loan, at $12,614,558. The total earnings for the year on gas account amounted to $1,609,583, to which should be added certain earnings applicable to "tangible and intangible property" (chiefly concerned in the operations of the Astoria Light, Heat, and Power Company) amounting to $1,019,605—making a total of $2,629,188. This is equivalent to 3·32 per cent. on the "tangible and intangible" property employed in the manufacture and distribution of gas sold by the Company. The dividend paid for the twelve months was 6 per cent., amounting to $5,988,990; and the funded interest absorbed $479,435·19. But the dividends and interest on stocks and bonds of other undertakings controlled by the Consolidated Company amounted to $5,375,936; thus allowing of the carrying to the surplus account of $1,536,699.

Owing to extraordinary expenditures on account of the extremely cold weather in January and February last year, which caused a vast amount of additional work in clearing frozen services and house pipes (there having been 122,675 cases of this character, as against 26,278 in 1911), and also to the extensive repavement of city streets with new and costly pavement, which involved the overhauling of 541,722 feet of gas-mains (of which 277,089 feet belonged to the Company), or more than were overhauled during the preceding four years, the Company, from their operations in 1912, show a net decrease, notwithstanding the fact that there was an increase of 2·88 per cent. in the sales of gas. It is also noted that an increase in prices of materials used by the Company, in twenty of the largest items, amounted to 12 per cent.

The tunnel between Astoria and the Bronx was extended 2464 feet last year; and the 72-inch pipes to be laid therein were in course of delivery when the report was issued. With the completion of the tunnel and the installation of mains connecting the distributing systems in the Bronx and Astoria, there will have been completed comprehensive plans for ensuring an uninterrupted supply of gas in the three boroughs supplied by the Company and those affiliated with it—thus conserving permanently the safety and convenience of the public.

The new water-gas plant at Astoria was put in operation on May 3, 1912. Each generator in this station has its individual turbine-driven blower directly connected to it, which is an arrangement more satisfactory than the former practice of having an independent blower plant in a separate building from which the air supply was common to all the generators. It minimizes the danger of explosion in the air-conducting pipes, and enables the operator to vary at will the air pressure and supply to each generator. Exhaust steam from the turbines and pumps, which, according to former processes, was unavailable for the purpose, is now used for gas making in the new plant, instead of live steam direct from the boilers. Both of these improvements are proving more economical than the former practice, and are the result of experiments carried out in some of the other plants before the completion of the Astoria plant. In the coal-gas settings, the Company have finally adopted silica material as being more economical. Its first cost, which is greater than that of fire-clay, is more than compensated for by its longer life and the better results obtained from its use. A new gasholder, having a capacity of 10 million cubic feet, was brought into use on July 30.

The Company's Emergency Department is equipped with five automobiles furnished with all the necessary tools for any emergency that may occur owing to a leakage of gas. The report states that "the promptness in leaving stations in response to calls, and the short time elapsing in almost every instance in arriving at the source of the complaint, cannot be excelled by even the Fire Department; and the system is unquestionably the most efficient of any gas company in the world to-day."

The Company purchased, and placed at the service of doctors, hospitals, fire and police departments, and the public in general, four "Pulmotors." They are designed for the resuscitation of victims of asphyxiation from whatsoever cause; and it is stated that they have proved highly efficient. Approximately 150 employees of the Street Department of the Company have been instructed in the application of the "Pulmotor;" and they, and hundreds of others, have also been taught the new methods of artificial respiration. All hospitals and the police and fire departments have been notified of the installation of these appliances and been informed that the Company's Emergency Department will respond immediately to all calls for them. Although these appliances were only installed during the past autumn, they have been instrumental in saving a number of lives.

The first year of the course in "Gas Salesmanship," conducted by one of the prominent Gas Associations, in which many of the canvassers and agents of the Company and the affiliated Companies entered, has been completed. This educational course has greatly benefited the men who availed themselves of it, and made them more efficient in the performance of their duties, especially of those which bring them in contact with the public. Changes and improvements in the course, contemplated for the present year indicate that it will be even more valuable in the future. The Company pay the necessary tuition fees of all employees who enrol in the course. The School of Instruction, in which employees in the meter department are specially trained for the work they have to perform, was attended by 933 students during the year. A course in accounting, consisting of weekly lectures by a Professor of Accounting from the New York University, and the periodical examination of students, which was started during the year by the New York Edison Company, and attended by employees of both the Gas and Electric Companies, would, it was expected, be completed in February this year. It will be followed by a series of lectures designed to illustrate the application of accounting theories to the practical operations of the various departments of the gas and electric business.

The monthly meetings of the Society of Gas Engineering of New York City were continued throughout the year. The membership of this organization is limited to employees holding responsible positions in the manufacturing, constructing, and distributing departments in the Company and those affiliated with it. These meetings furnish an opportunity for the heads of such departments and their assistants to exchange ideas and experiences in connection with their work. Technical papers and reports are read and discussed. The value of such intercourse is believed to have been enhanced during the year by the delivery of lectures by a number of gentlemen, prominent in the scientific world, relating to some aspect of gas-works operation and construction, and the distribution of gas.

The utmost care is taken to protect the Company's employees and the public from avoidable accidents. A Safety Department, in charge of experts who are not part of the regular force of the Company, makes frequent inspections of all the operating departments involving plants, holders, new construction, street openings, shops, and office buildings. Upwards of 32,000 such inspections were made during the year. They resulted in the installation of guard-rails, safety appliances, and other preventive measures designed to minimize the danger of accidents.

The urgent necessity for developing the utilization of gas for other than illuminating purposes is emphasized by the fact that the estimated consumption of gas by the additional gas appliances installed each year exceeds the actual growth in the annual sales—clearly indicating that were it not for this increasing development the total output of gas would diminish year by year. Old buildings, in which heretofore gas has been the only means of illumination, are being constantly demolished, to make room for new ones equipped for the use of electricity, by which means the output of electric current is augmented at the expense of the gas business. In order to avail themselves of every possible facility for increasing their output, the Company have organized a Department of Utilization, and placed at its head an engineer who is experienced not only in the technique of gas manufacture and distribution, but has specialized in the field of gas utilization.* "This department," says the report, "will devote itself to the investigation of all appliances in the market designed for the utilization of gas for domestic, commercial, or industrial purposes, and all new appliances hereafter invented or offered for sale, as well as the study of existing appliances, with a view to their modification or alteration for the purpose of obtaining greater economy or efficiency in their use. It will canvass the subject of gas utilization for the purpose of discovering possible new uses to which gas may be applied in lieu of other fuel, and will seek information regarding the activities in the field of gas utilization of other gas companies and manufacturers of gas appliances, both in America and abroad. It will also endeavour to devise new and better methods of exploitation of gas as fuel, and of popularizing its employment for this purpose." During the year, the associated Companies installed 89,389 gas appliances, including 2445 lineal feet of hotel gas-ranges.

The municipal street-lamps on the lines of the Company and the affiliated Gas and Electric Companies on Dec. 31 last, consisted of 24,758 incandescent gas-lamps, 122 open flame lamps, 10,419 electric arc lamps, and 11,431 electric incandescent lamps—a total of 46,730 lamps. The number of gas-meters in use at the end of 1912 was 875,017, and of electric meters 221,361. The combined sales of gas during the year were 28,938,236,256 cubic feet—an increase over the previous year of 3·86 per cent. The sales of electric current during the year amounted to 407,966,066 kilowatt-hours—an increase of 22·37 per cent. There was expended for the improvement of the producing and distributing plants, the sum of $12,547,963.

PROFITS AND THE RATES.

Mr. Sidney Webb on the Manchester Gas Undertaking.

In the course of a paper submitted at Manchester recently, Mr. Sidney Webb made some comments which were subsequently dealt with by the Chairman of the Gas Committee in an interview reported in the "Manchester Courier." The occasion of the paper was the Labour Elected Persons' Conference, and it was entitled "How about the Rates?" In the course of his remarks, Mr. Webb said he was afraid most elected persons would say that what most hindered municipal progress was the ratepayers' fear of any increase in the burden of rates; and he maintained that it was impossible, consistently with a continuance of local self-government, ever to get rid of the ratepayers' grumbling at every increase of the rates. He then continued:

But even if we cannot hope to get rid of the ratepayers' grumbling at every new development of local service, may we not expect to get some immediate relief from the present burden? There is, first of all, as some will say, the profit to be derived from municipal enterprise. Some municipalities make a large profit on their gas-works' or on their tramway service, or on their electric light concerns; and they devote this profit to keeping down the rates. There may be something to be said for this policy, up to a certain point. The municipality may fairly take for the common good such part of their trading profits as arise from the fact that they are derived from monopoly. But this is usually a very small part—often, indeed, no more than a necessary margin between receipts and expenditure.

When the Town Council in Manchester or Nottingham make a large profit out of their gas-works, or out of the tramway service, or out of the electrical installation, they are almost always getting the profit unfairly, at the expense either of the employees or else of the customers. It is unfair to pay bare subsistence wages to the corporation employees,

*The appointment of Mr. Oscar H. Fogg to this position was noticed in the "JOURNAL" for Feb. 4 (p. 327).

and work them long hours, and subject them to degrading conditions of labour, merely with the object of earning a profit for the relief of the ratepayer. I was shocked to find some years ago, when I visited one of the great gas-works of the Manchester Corporation, that nothing whatever seemed to have been done, after a whole century of municipal ownership, with the object of making the Manchester gas-worker into a Manchester citizen. He seemed to be paid no better, to be worked no shorter hours, to be treated by the foreman or manager with no more consideration, to be thrown every summer out of work as callously, to be granted no more holidays on full pay, to be accorded no greater sick leave or superannuation, to be given no more opportunity of changing his clothes and taking a bath, to be allowed no more comfort and amenity in the places where he had to work, and wait, and eat his food—in a word, provided with no more of the conditions of civilized life than the gas-worker who is under the ordinary capitalist company.

And what seemed to me even more grievous was that nobody in Manchester even thought that there was anything wrong in this. It does not seem to have occurred to the Manchester Gas Committee that they were open to criticism for treating their employees no better and no worse than private employers. I assert that it is the duty of every public authority to take care that all the conditions of employment of all their wage-earners are such as not only to permit of, but also actively to promote, a decently civilized life, before they take a penny of the so-called profits of their enterprises in relief of the ratepayer. Moreover, there is no sense in charging an unduly high price for any public service in order merely to benefit the ratepayer. For instance, when the Manchester Corporation make, year after year, a large profit out of their gas-works, they are really taxing the consumers of gas in proportion to their consumption of gas for the benefit of the owners and occupiers of Manchester house property, roughly in proportion to their wealth.

For we must remember that, whenever we give any relief to the rates, we necessarily give most relief to those who inhabit the largest houses, or who own the greatest amount of house property, and who, therefore, need it least. The consumers of gas in Manchester are now, for the most part, either the industrial users of power gas (which is supplied at a specially low price, very little above cost), or else the tens of thousands of small homes unable to afford the electric light, or using gas for cooking, often by the penny-in-the-slot machine. Why tax these, in order to make the rates lower for the more opulent ratepayer? Further, it does not seem sensible for one department of the Manchester Corporation to be trying to diminish the smoke nuisance, while another department of that same Corporation are, by charging unnecessarily high prices for gas, actively promoting the use of coal-fires. And it is a short-sighted policy, as well as a narrow-minded one, to penalize the use of gas in a great city. The opportunities for municipal expansion in the popular use of gas—notwithstanding all the encroachments of the electric light—are still enormous. The Gas Committee ought to be playing for a doubling and a trebling of their business until not a single family are left unsupplied. We ought everywhere, therefore, to urge a reduction in the price of gas—better still, the free grant of greater facilities for its use by small consumers—rather than any reduction of rates out of gas profits.

The conclusion arrived at by the author was that though it was proper to have a balance on the right side in each case, they ought not to look to this source for any substantial relief of the rates.

A Reply to Criticisms.

Mr. William Kay, the Chairman of the Manchester Corporation Gas Committee, when interviewed, said Mr. Webb's strictures on the undertaking were "rubbish;" and in support of this contention, he argued as follows:

The gas undertaking is for the general good; and there is no earthly reason why the 1100 or 1200 men working for the department should receive treatment better than that received by their fellow-citizens or ratepayers. So far as the working conditions at the Gas Department are concerned, I can say without hesitation that they are the best of any corporation gas department. Even Mr. J. R. Clynes, M.P., the General Secretary of the Gas-Workers' Union, gives us credit for being right in the very forefront of gas organizations in regard to the treatment of our employees. We pay our gas workers—*i.e.*, stokers—6s. per shift; and as such men always work seven shifts a week, their wages are two guineas weekly. The labourers are, of course, in receipt of the 26s. minimum wage for Corporation employees, and no man in the department works a longer shift than eight hours without extra remuneration. Mr. Webb is quite wrong when he says the men are thrown out of work every summer. With the exception of a few of the last-comers, no one is thrown out of work during the summer. When indoor work cannot be found for the men, they are drafted into the yards, or are put at work on the street-mains, the relaying of pipes, &c. We are most considerate in this respect; and the proportion of men for whom work is not found during the summer months is very scant indeed. They only consist of a few of the more recently engaged men, and certainly none of the older hands are discharged.

As an instance of the good relations which exist between the Committee and the workmen, Mr. Kay stated that the Committee had just completed at the Bradford Road Gas-Works what would be without doubt one of the finest suites of dining-rooms, lavatories, &c., for the use of the men. These offices had been erected in conjunction with the suggestions of the Workmen's Committee which exists at this works; and, if the scheme proved successful, similar arrangements would be made at the other stations under the jurisdiction of the Committee. The whole of the men were entitled to a week's holiday each year, and during sickness received four weeks' full pay; while they had also the advantage of the Corporation thrift fund, if they cared to join the institution. The men in the Gas Department were so well-treated, he added, that it had been asked on more than one occasion whether the department was not a philanthropic institution. Dealing with Mr. Webb's other criticisms, he explained that the Gas Committee had recently made a reduction in the price of gas which would save the consumers £61,000 per annum; while they had also promised not to cease their annual contribution of £50,000 per year to the rates. The gas consumer and ratepayer was very much one and the same person, as would be seen from the fact that there were 183,000 gas consumers and 160,000 ratepayers. The Committee were doing everything possible to popularize the use of gas by offers of free cookers, and the free fixing of stoves, at a very small hire; and their efforts were resulting in a steady increase in the consumption of gas.

WESTON-SUPER-MARE GAS COMPANY.

Alleged Irregularities.

An adjourned half-yearly meeting of the Company was held last Thursday week, for the purpose of receiving and considering the report of a Special Committee appointed to inquire into matters affecting the Company. Mr. E. E. Baker, the Chairman, presided over a large attendance, and at the outset called upon the Chairman of the Special Committee (Mr. W. C. Thomas) to read his report. This was as follows.

> The Committee of Directors and stockholders of the Weston-super-Mare Gaslight Company appointed to investigate allegations made by Mr. Spreadbury, met on March 6 and two subsequent occasions; Messrs. King and Culling being present at the two first meetings. They carefully inquired into the various statements made, and found that some had no foundation in fact. Others were more or less accurate, and were admitted. They came to the conclusion that Mr. King had acted in an irregular and indiscreet manner in his capacity as a Director of a public company, and unanimously resolved "that he had forfeited the confidence of his fellow Directors and stockholders, and that he should be called upon to resign his position as a Director." The same remarks apply to Mr. Culling's conduct as Secretary of the Company, having entire control of the fittings department. It transpired that Mr. Culling had been furnished with a copy of the allegations made against him; the Directors asking him for his reply thereto. After a lapse of about three weeks, Mr. Culling sent a type-written reply, which was handed to the Committee, and was by them considered very unsatisfactory. During the investigations, Mr. Culling asked to be allowed to make a verbal statement to supplement his type-written reply; and to this permission was readily granted. He then addressed the Committee at considerable length, but entirely failed to place his conduct in a more satisfactory light. It was unanimously resolved that he should be asked to resign his position as Secretary of the Company. The Stockholders' Committee unanimously resolved that no reflection whatever can be made upon the other Directors of the Company; and we desire to record that they have given us every assistance in our investigations.

Commenting upon the matter, Mr. Thomas said the stockholders appointed the Committee to do what they all must have felt to be a very unpleasant duty. They went to that duty with open minds, and with the desire to thrash out the allegations. They had no feelings of spleen, or anything of that sort, towards the two gentlemen against whom the allegations were made. The Committee had, to the best of their ability, gone into all the details which were placed before them. They had arrived at the decision stated; and he thought both the gentlemen must say—indeed, they had said—that they were treated with the utmost courtesy and fairness in their indiscretions, and they had to leave the matter at that point. He moved the formal adoption of the report.

Some discussion then ensued, in the course of which Mr. Young said he would like a few more particulars before being in a position to vote for the resolution. To this the Chairman replied that the Committee had taken an immense amount of trouble over the matter, and it was inadvisable, it was unnecessary, and it was very much against the best interests of the Company, that the affair should be gone into in detail again. Mr. Culling, speaking as a stockholder, said he would like to ask whether it was not a most remarkable thing that, if a man was found guilty, he should be given a first-class testimonial from his employer as had been done in his case. Further, though he had asked for definite reasons as to why he had been requested to resign, these reasons had never been given him. He was not guilty, and had served the Company faithfully and well.

Some further remarks were made, and the resolution was then put and carried unanimously.

On the Tuesday preceding the meeting just referred to, a large gathering (including many stockholders in the Company) assembled in the Wellington Rooms—a meeting having been convened by Mr. Culling, to hear an explanation as to "the rumours current in the town regarding himself."

Addressing those present, Mr. Culling said that when he entered upon his duties in March, 1911, he took a house which was too great a distance from the gas office. Therefore, having the interests of the Gas Company at heart, and as much for their benefit as his own, he purchased the lease of a house almost opposite the office. At the time of moving into his new house, he was so extremely busy that he worked without many exceptions until 11 p.m., and sometimes later. He might say on several occasions until 1 or 2 in the morning, and once, in fact, he worked all night. With those conditions prevailing, he was prevented from assisting in the removal, &c.; and, as he had said, being at work in the Company's interest, he did not hesitate to instruct some of the Company's men, after they had finished their ordinary duties, to do a little work which was necessary, and which he should have done himself at the house, had he not been at the offices of the Company. The result of his energies, as shown by the balance-sheets, had been an enormous increase of business. After six months, in December, 1911, the increased consumption of gas was only 1½ million cubic feet; whereas the figures for the half year ended December, 1912, were 16½ million cubic feet—a difference and an increase of no less than

15 millions. It cost him a considerable sum of money to move; and, as he had previously stated, he took the house chiefly for the Company's sake. He did not hesitate to have several gas-fires and the necessary fittings fixed on loan, as usual—they still remaining the property of the Company. Some of them were really fixed for testing and experimental purposes. It was a recognized custom with gas offices to supply their officials—and especially the officers in charge of the distribution department—with gas apparatus on loan, to enable such officials to speak to customers from actual and practical experience. He had often taken customers into his private house, and shown them the various fittings in use, and by so doing had secured orders for the Company which in all probability would have been lost. Now, he had never been paid a single penny for his late and extra work, nor had he been able, owing to pressure of business, to take any holidays since his appointment. During the past two years, he could safely say he had saved the Gas Company at least £1000. The details of this, in his capacity, he was not allowed to divulge. After all this, they could imagine how hurt he felt when he heard it had been reported that he had been robbing the Gas Company by having their fittings fixed in his house as had been explained. A Special Committee were appointed by the proprietors to investigate the report circulated, and the matter generally. He appeared before that Committee, and explained quite fully and truthfully all he had done, and that the allegations made were unfounded. After the Committee had completed their inquiry, he was, to his very great surprise, asked to resign. Naturally, he asked why, and what was the reason. He was not told, but referred to the Directors; and though he had repeatedly asked the same question, he was still awaiting his answer. However, he had heard from a very good source that the reason he had been asked to resign was because he had appeared to shield another gentleman. Having heard this, and knowing it to be incorrect, he at once appealed to the Special Committee for another interview; but, strange to say, had been refused. He therefore felt, and he thought they would feel, that he was not being treated fairly. He did not ask for, nor did he require, any favours. What he wanted, and felt he was absolutely entitled to, was a further hearing and a chance to refute any unjust accusations. This, surely, was only justice.

A number of questions were put to Mr. Culling by Dr. Grey, who said it had been suggested that Mr. Culling admitted to the Committee of Inquiry that a large quantity of goods were ordered by a certain gentleman, taken away, but no entry made for six months. The work in question, he added, was very unusual work for a gas company to do—decorating walls, putting in baths, doing sanitary work, supplying iron rails, door-handles, &c. Mr. Culling said any work done was charged up when completed. Dr. Grey: How many months elapsed before the entries were made? Mr. Culling: I am afraid I must refer you to the Gas Company. Replying to further questions, Mr. Culling said the fittings on loan at his house were not paid for, while with regard to the consumption of gas, he did not get an account at the end of the quarter. It was not an instruction from the Directors that he should have it gratis; but it was the usual practice.

At the close of the meeting, a large number of those present signed a petition to the proprietors on Mr. Culling's behalf.

New Inverted Incandescent Gas-Lamp Company, Limited.

At the recent ordinary general meeting of this Company, the Chairman (Mr. G. H. Cartland) stated that the total profit for the past year was £10,955, compared with £11,667 for 1911; but he pointed out that they did not begin the year satisfactorily, on account of the coal strike. The Directors had dealt with the profit by writing a couple of thousand pounds off the patent account, placing £1000 to reserve, and paying the same dividend as last year—viz., 6¼ per cent.—which absorbed £6766, and carrying forward £1356, which was almost identically the same amount as was brought into the accounts. As the Company had just completed ten years of existence, he thought the shareholders might be interested to learn something of what had been done during this period. They had made a trading profit of no less than £96,351, of which £22,037 had been written off patents and goodwill; they had a reserve of £7000; they had reduced the debentures from £14,000 to £10,000; and on the day the accounts were closed they paid off a further £2000, so that the debentures now only amounted to £8000. The present was the sixth successive year that the shareholders had received a dividend of 6¼ per cent. During the ten years there had been distributed in dividends no less than £47,056. He thought this was a very satisfactory record, and the shareholders had every reason to congratulate the Managing-Director (Mr. James Bridger) on the excellent results he had been able to achieve, and the efficient staff which had helped him to bring about these results. He concluded by moving the adoption of the report and accounts. Mr. Bridger, in seconding the motion, assured the shareholders that, so far as the inverted incandescent gas-burner industry was concerned, the Company well maintained their position. The motion was carried unanimously.

Calorific Value of London Gas.—In noticing last week the report of Professor Vivian B. Lewes, F.I.C., F.C.S, the Gas Examiner to the Corporation of London, for the past year, it was mentioned that all the parliamentary requirements had been complied with. It may be of interest to add that the uniformity in the quality of the gas shown by the Examiner's tests applied equally to the calorific value; the average (in calories net per cubic foot) of all the daily tests taken at the three stations being: Aldersgate Street, 123·3; Fenchurch Street 123; Tudor Street, 123·4.

Temptation of the Penny-in-the-Slot Meter.—At the Stratford Police Court, on the 22nd ult., Ethel Stewart, a married woman, of Morley Road, Leyton, was charged with stealing 1s. 8d. from a gas-meter in the house. An inspector found the lock broken off the meter, and there was no money in it. Mrs. Stewart now pleaded that she committed the theft because she was distressed. Her husband had been out of work for two months. Detective Dixon said that, with the exception of a bedstead, there was no furniture in the house. The accused was dealt with under the First Offenders Act.

GAS v. ELECTRICITY FOR COOKING PURPOSES.

Debate at the National School of Cookery.

It was briefly mentioned in the "JOURNAL" for the 11th ult. (p. 703) that, at the first annual conference of the Old Students' Guild of the National Training School of Cookery, there was a debate on the subject of gas as compared with electricity for cooking purposes. For the following fuller report of the remarks of the two chief speakers we are indebted to the number of "Education" for the 21st ult.

Miss HELEN EDDEN, Principal of the Advisory Staff of the Gaslight and Coke Company, opened the discussion with a paper describing the merits of gas. She pointed out the economy, safety, and convenience of gas-cookers. The cost of using, she said, is small; 1d. per 33 cubic feet of gas consumed being an average price for Great Britain. No nutriment is lost from food during cooking. The distinctive smell of gas is a warning of danger; and the convenience of gas in quick grilling, boiling, and baking is unquestionable. If properly managed, gas-stoves built on modern lines should be exonerated from the criticisms so often brought forward by electricians—viz., the lower temperature efficiency of a gas-oven, the possibility of tainting of food, and the shrinkage of meat so cooked. As regards the temperature efficiency—a gas-oven lighted 15 minutes before use is absolutely ready for cooking any food; and after being thoroughly heated in this manner the gas may be lowered considerably, and cooking continued satisfactorily with a very small consumption of gas. The principle of heating thus is on the same lines as the old-fashioned brick oven, where the fuel is kindled inside and withdrawn when the oven is really hot. Compared with this, an electric stove needs longer time to heat—20 minutes with the current full on to heat the oven, and another 20 minutes must elapse after putting the joint into the oven before allowing the allotted time necessary to cook the meat thoroughly. A quart of cold water boils on a gas-ring, using 2 cubic feet of gas, in 8 minutes; whereas the same amount of water, if cold, takes 20 minutes on a "Tricity" stove. The possibility of tainted food is non-existent. The products of combustion are quite harmless with a free burning bunsen gas-flame; and the food is cooked with a current of fresh air flowing through the stove. As to the last criticism—shrinkage of meat—all meats contain a large percentage of water, and the evaporation of this water during cooking makes the difference in weight between raw and cooked meat. There is no reason why more water should be lost in a gas-oven than in an electric oven, provided the conditions are equal. Experiments have been made to show that a joint weighs less after cooking in a gas-oven than a similar one after cooking in an electric oven; but though the water was retained in the joint roasted in the electric oven, the juices had escaped. A large quantity of the brownish jelly was discovered in the dripping basin on examination—proving that, in spite of the greatest heat the electric oven could supply, it was too cool to retain the juices properly by sealing the outside of the joint. Therefore, though the longer, slower cooking served to produce less evaporation of the valueless water, the valuable nutritive juices had escaped. The speaker then showed the universal popularity of gas-cookers—upwards of 500,000 being in use in the districts of the Gaslight and Coke Company alone; and she concluded by emphasizing the economy and practicability of such stoves.

Miss PADLEY, Lecturer for the "Tricity" Company, then gave her views upon electricity for cooking. She said: There are three primary points that should be considered when selecting an agent from which the requisite heat energy is to be drawn for cooking purposes—purity, convenience, and safety. To consider the purity of the source of heat utilized for cooking, all the electrical energy is converted into heat energy in up-to-date stoves; so one can cook with an electrical cooker all day and never come in contact with, or breathe, any noxious fumes whatever; whereas gas is known to have an injurious effect on the eyesight and general health of the cook. Also the possibility of the contamination of food by contact with burnt or unburnt gases is impossible. The difference between food cooked by electricity and that by gas can be seen, and is commented on daily by hundreds of people inside and outside the shop windows of the "Tricity" House in Oxford Street. As to the convenience, consider the light, polished, ever-bright electric oven on its bench, with its perfect accessibility, which can easily be taken to the scullery sink and thoroughly scrubbed, and contrast it with its ever-black, and consequently never-washed, brother, whose mass necessary to withstand flame and fume makes it impossible to move. Cleanliness is a vital factor to foods and their flavour. The requisite heats with an electric stove are excellently controlled by switches, and unaffected by the turning on of a neighbour's stove; for the law forbids undue drop in pressure. No leakage, no explosions, the air in the vicinity is not consumed or vitalized; neither shock nor ill of any kind is ever possible, so perfectly controlled is the heating agent. Whereas gas does smell, it may blow up, and briefly it has the uncontrollable and the elusive qualities of a gaseous fluid. The question of the reduced shrinkage of meat may at first seem doubtful; but experiments, made personally before witnesses, have shown that when cooked in a gas-stove a joint loses 25 per cent. of weight, whereas in an elecrical cooker only 10 per cent. is lost. These statistics have constantly been compared with many others, with results that vary very little. The case of a pork butcher, accustomed to cooking large-boned legs of pork, may be taken as an example. Two joints of pork (which meat shows greater shrinkage than any other) were taken, one weighing 13 lbs. 8 oz., and cooked in a gas-stove, the other 11 lbs. 13 oz., cooked in a "Tricity" stove. On weighing the two joints of different weight after cooking, the result was exactly the same—8 lbs. 13 oz. A friend meeting him one day said: "Do you know what it is you are making such a fuss about in this electrical cooking? Water, that's all—water; and your savings are water." The pork butcher digested this remark awhile, and whimsically replied: "Doesn't affect me; I am selling it at 1s. 2d. per lb. just the same." In reply to the remark as to the amount of gravy lost in experiment made by the previous speaker, it appeared she was unfortunate in her experiment, for clients sometimes grumble that there is so little gravy in the grease-

pan; but they realize that they are obtaining it in the best possible way when the joint is cut and the gravy rushes out. There is less dripping; but it is better in the joint than in the pan.

These papers were listened to with great interest by the audience, and one or two who had used gas-stoves for many years, and seemed loth to change their views, argued that the flavour of food, and especially meat, was superior when cooked in a gas-oven, which more closely resembled roasting in front of the fire.

At this point a member rose and spoke of a wide personal experience of both kinds of stoves. Though having no complaint to make of gas, she gave a thoroughly satisfactory account of all her electrical stoves, and said there was absolutely no foundation for the statements that the flavour of food cooked therein was different. It was her opinion that though the outfit seemed at first a greater outlay, the cost of using was very little greater than cooking by gas, especially as the heat retained in the stove after the current was switched off (residual heat) was sufficient to cook many things of the custard, sponge cake, and milk pudding type.

Questions on electrical stoves were then put to Miss Padley by those unaccustomed to this method of cooking; but the opener of the discussion was not invited to sum up or reply.

ADVERTISING VALUE OF OUTDOOR GAS LIGHTING.

The last "Bulletin" of the American Commercial Gas Association contains the following article on this subject, by Mr. J. P. Conroy, the Manager of the General Gaslight Company of New York.

The sale and installation of outdoor gas "arc" lamps is, beyond a doubt, the best and most positive means of promoting the sale of gas for illumination; for the reason that it seldom, if ever, displaces other forms of gas lighting, as is the case in indoor lighting, and there is no objection to the heat in the summer months if the merchant is properly coached or educated as to the value of those lamps to advertise or display his goods in windows after the store is closed. They have the advantage of being a gas consumer of long hours, even when the stores close early and all interior lamps are extinguished. But the outdoor gas arc has another advantage that seems to us far greater than those herein enumerated, and that is its advertising value.

A gas company will spend many thousands of dollars fitting up elaborate show-rooms to display their appliances, which have a certain amount of advertising value; and they will spend large sums advertising in daily papers. But such advertising, to our minds, is not seen or noticed by the prospective customer, and when thus seen it does not impress the customer in the same way as a number of outdoor lamps installed and in practical use on the business streets – providing, of course, that they are being properly maintained (which is very essential), cleaned, and are working in an efficient manner.

A hundred outdoor gas arc lamps installed on the business streets of any city of from 20,000 to 100,000 inhabitants, in our opinion, have a far greater advertising value than all the fuel appliances or residence lighting installations, for the reason that it is seldom, if ever, that the public see a fuel appliance in actual operation, and if they do they have no means of observing how efficient and practical an appliance it is. On account of lack of maintenance of residence lighting, one often sees these lamps under very unfavourable conditions; while all, or nearly all, the people of any city must pass through or visit the business streets. It is there that they cannot help noticing and being impressed with the outdoor gas arc lamps in front of the business houses; and the impression thus made goes far to encourage the use of gas lighting in the homes.

One can better appreciate the advertising value of outdoor arc lighting by illustration. Were an advertising salesman to conceive a scheme whereby he was able to get a display of the merchants' goods in front of most of the stores on the business streets, the merchants would pay liberally for such advertising, while the gas company not only get this privilege free, but get paid for doing it. We believe the people are, in outdoor lighting, far in advance of the commercial department of most gas companies, for the reason that almost every private residence being built to-day, excepting the very humble ones, is provided with some kind of artificial illumination on the porch or out in front to light the way for the occupiers or their guests. If this is prudent in their case, is it not far more important for a storekeeper to illuminate the front of his store to attract and light the way for his customers?

When one fully considers the advertising value of outdoor gas lighting as well as the special advantage it has as a means of increasing gas consumption for illumination, is it not to be wondered that far greater strides have not been made along this line, so that the front of every public building in almost every city—such as the post office, courthouse, schools, theatres, hotels, and churches—should be illuminated with outdoor gas-lamps, thereby helping further to keep your goods and service constantly before the public, as well as to increase your consumption?

In order that a gas company may take advantage of the advertising value of outdoor lighting, the all-important thing is, as already stated, proper maintenance, by regular inspection, cleaning of lamps, glassware, bunsen tubes, and burners; thereby assuring themselves that the lamps are always in perfect working order.

The human eye is like the film of a camera. The moment it is exposed to an object, an impression is made on the mind. Artificial light naturally attracts the eye; and the moment it is thus attracted, an impression is made as to its quality and the amount of illumination given, together with the appearance of the fixture and the installation. If the impression instantly made is good, you have practically made a convert to gas lighting, whether it be for store, factory, or residence. On the other hand, if the lamps are neglected, are in bad order, and the design of the fixture and installation poor, you have made a bad impression on the mind of your prospective customer that it will be difficult for you to overcome in the future.

We are all more or less imitators, and do the things we see others do in our daily walk of life. Hence if some of the merchants put up outdoor lamps in front of their places of business, and they prove successful, it is only natural that others will follow.

Outdoor lighting has a decided advantage over all other means of advertising, because seeing is believing. One cannot pass through the streets in the business centre of a city after dark without seeing and being impressed with the outdoor lamps displayed in front of the stores; and the impression thus made has a far greater effect than columns of cold type advertising matter endeavouring to attract and describe the advantages of gas lighting. With the many advantages of outdoor gas lighting, it seems that gas companies should exert every effort to encourage the use of outdoor lamps, and spare no time or expense to see that such lamps are at all times properly installed and maintained.

MENACE OF GAS TO ELECTRICIANS.

The following remarks on the above subject appeared in an editorial article in a recent number of "Electrical Merchandise and Selling Electricity"—a Chicago publication. They bear testimony from the other side to the prevailing activity of everybody who is engaged in the gas industry.

The electrical industry has become so used to "putting it over on" the gas man, that we take our supremacy entirely too much for granted. We have mentally relegated gas to the kitchen stove, where we acknowledge its virtue, and have gone about the business of selling signs, motors, and similar exclusively electrical utilities, with complete blitheness of spirit. The idea that the gas-mantle might ever become a serious competitor of the modern tungsten filament incandescent is one that has not even occurred to us.

Yet it is safe to say that gas lighting is making greater strides to-day than ever before. According to an authority who cannot be disregarded, the consumption of inverted gas-mantles is now close on 30 million per year. The ruggedness of the inverted mantle accounts for no small amount of this growth; but the aggressiveness of those who have gas for sale accounts for most of it.

Ask anyone familiar with both gas and electric service and he will not hesitate to say that the gas men—that is to say, the gas company men—are to-day applying more advanced methods in promoting business than are the electric men. Their Associations are doing more practical work; and as individuals they are more keenly alive to their opportunities.

Nor are the manufacturers of gas appliances far behind. The "quality idea" has taken hold in the gas industry; and the development work of many manufacturers is in the direction of a higher grade of fixtures, burners, fittings, and appliances—equipment which is not offered with the plea of cheapness but on the basis of inherent quality. With the natural advantage of lower maintenance, gas lighting becomes an attractive proposition when employed in fixtures which satisfy the æsthetic requirements. So long as gas equipment looked cheap and shoddy, the chief argument of the electric solicitor was a sneer. To-day we see gas equipment which is no whit inferior to the best offered for electric service—and giving double the light at one-half the cost.

In street lighting, also, the gas man is becoming disturbing. He has new units which are a long way ahead of the ordinary incandescent street-lighting equipment; and his prices look mighty attractive to municipal authorities. He is quietly sizing-up the many situations where the electric man has not taken advantage of opportunities, and promises a good deal of trouble.

This is not a calamity howl. We have no idea that the electric lighting business is about to be wiped out or even seriously crippled. But we do know that competition of a vigorous sort is forming, and that the central station man who fails to note the storm signals is in for an exciting commercial contest.

COKE MANUFACTURE IN BELGIUM.

According to some particulars recently given in the Engineering Supplement to "The Times," there are at present at work in Belgium 44 coke-oven plants with 3400 units, employing 4000 workmen. The total output of metallurgical coke amounted last year to about 3,200,000 tons, worth about 75,000,000 frs., corresponding to an average price of 24·40 frs. per ton, against 23·26 frs. in 1911. The yearly consumption of coal amounts to some 4,200,000 tons, of which 35 per cent. is imported. In the Liége district, owing to the progressive exhaustion of coal suitable for coke manufacture, the proportion of foreign coal consumed amounts to 50 per cent. During 1912, the exports of Belgian coke reached 1,014,796 tons, and the imports of foreign coke amounted to 957,743 tons—90 per cent. of it being from Germany.

The Charbonnages Belges at Frameries (Hainault) recently started a new plant, comprising a battery of 106 units, with bye-product recovery, which is claimed to be the largest in Belgium. A first battery is expected to be put in operation next month at the Grivegnée works (Liége), and the Sambre and Moselle firm (near Charleroi) are engaged in constructing a third battery, which will be capable of yielding a monthly output of 10,000 tons from the present month. The Charbonnages du Nord de Genly, in the Charleroi district, expect to begin operations in May with a battery of 30 coke-ovens of the Solvay type. Works are expected to be taken in hand shortly by the Espérance Longdoz firm (Liége district), in connection with the erection of a coke-oven plant of 100 units with recovery of bye-products and use of gas for the generation of electricity. The daily output is estimated at 500 tons, and an expenditure of 5,000,000 frs. is proposed. In order to double their output capacity, the company working the Fours à Coke du Nord at Hoboken, near Antwerp, are erecting a second battery of 30 units, which it is expected will begin work in September.

WELLINGTON (N.Z.) GAS COMPANY, LIMITED.

New Works at Miramar—Employees as Shareholders.

The Forty-Third Annual Meeting of this Company was held on the 14th of February—Mr. DAVID NATHAN (the Chairman) presiding.

In their report, the Directors stated that there had been a steady growth in the demand for gas during the year. There had been 670 new services laid on, and upwards of 800 gas-cookers sold and fixed. Gas was made at Miramar on the 20th of July; and the new works had proved quite satisfactory. An interim dividend of 5 per cent. was paid on the ordinary shares in August, and a similar dividend was now recommended.

The CHAIRMAN, in moving the adoption of the report, said the meeting was being held in a room which had been specially fitted up for the purpose of demonstrating cooking by gas. He trusted that, at the conclusion of the proceedings, the shareholders would be able to accompany the Directors to inspect the new works at Miramar, which had been in use since July 20, with good results both in the quality and quantity of gas obtained. The new works consisted of a unit designed to supply 750,000 cubic feet of gas in 24 hours, as compared with the maximum capacity of the old works of about 1½ millions per day. In other words, the new works were two-thirds the size of the old ones. The Directors would shortly have to decide, from the results obtained from the working of the vertical retorts, whether it would not be more economical to erect a second carbonizing unit at Miramar than to replace the horizontal retorts at the city works as they wore out. If there were any immediate demand for the purchase of these works, it would undoubtedly be the right policy to concentrate the manufacture of gas on the new premises, dismantle the old works, and dispose of the land. Though the new works had led to considerable economies in the amount of labour employed, these were to a large extent counterbalanced by the increase in dividend that had to be paid as representing the expenditure on the plant requisite to enable them to be effected. The increase in the gas sales during the year was 5·8 per cent.; being slightly greater than that in the preceding year. The number of new connections made was 670; and upwards of 800 gas-cookers were fixed. The Directors had issued 72,401 preference shares of £1 each, of which, he was pleased to state, employees took up 1588; and, on the expiration of the payment of calls, the Directors agreed to issue at par to employees 577 more preference shares, to be paid for in instalments before April, 1914. The Directors were satisfied that it was to the benefit of the Company that the employees should all have a personal financial interest in the concern; and they proposed to place the unissued balance of the authorized 75,000 shares at the disposal of any of the employees desiring to take them up. The half-yearly dividend on the ordinary shares recommended would absorb £10,943 of the balance of £32,220 on the profit and loss account—leaving £21,277 to be carried forward, as compared with £21,266 last year. In conclusion, the Chairman said he desired to place on record, on behalf of the Directors, their appreciation of the manner in which the Engineer (Mr. A. Dougall), with the foreman (Mr. Ingerton), had carried out the erection of the Miramar works. The Board felt certain that the shareholders would be pleased to hear that the Directors had suitably recognized their services.

The report was adopted, and the dividend recommended declared, without discussion.

GLOVER AND MAIN, LIMITED.

The Sixteenth Annual General Meeting of this Company was held in the Abercorn Rooms at the Great Eastern Hotel, E.C., last Thursday—Mr. R. B. MAIN (the Chairman) presiding.

The CHAIRMAN referred in sympathetic terms to the retirement of Mr. Richard Thomas Glover, the late Chairman, and expressed, on behalf of the Board, their appreciation of the valuable services he had rendered to the Company. In moving the adoption of the report, he stated that the output of the Company for the past year had been a record one, and far in excess of that of any former years. While labour troubles, involving increased charges, and the great advance in the prices of raw material had caused directors of all industrial concerns considerable anxiety, yet, through their obtaining reasonable advances in prices and by the greatly increased output, the Company's financial results had been very much improved—enabling the Directors, after making provision for the debentures, to declare a dividend at the rate of 5 per cent. on the preference and 6 per cent. on the ordinary shares, and at the same time to make a substantial addition to the reserves, the total of which now stood at £34,000. The Company were in a position to pay a higher dividend than that which had been declared; but the Directors considered the shareholders would approve the policy of strengthening the financial position of the undertaking by making substantial additions to its reserves. In order to maintain the leading position in the gas industry which the trading companies had so long enjoyed, they had, as the proprietors were aware, a Scientific Department, fully equipped, under the management of capable chemists, who had had special training in the applications of gaseous fuel. They had placed on the market a new type of gas-fire—the "St. Nicholas"—which had already obtained a large hold on public favour, and which, the Directors believed, would continue to maintain a unique position in the gas world. The coal strike, while causing considerable trouble and extra cost to manufacturers, had, on the whole, rendered good service to the gas-stove industry; the inconvenience resulting from the scarcity of coal inducing large numbers of people to adopt gas for cooking and heating. Valuable service had been rendered to the gas industry by the able policy of the British Commercial Gas Association in the education of the public by means of wide publicity in all the leading journals; and as this was to be followed by a National Gas Exhibition in the autumn, it would provide an exceptional opportunity of educating the architect, the builder, and the general public in the uses of gas. The Directors were glad to report that the present year had opened very favourably, and that the demand for their cookers and fires was being well maintained; and they had every reason to expect that during this year the Company would continue to merit the increasing patronage of gas engineers throughout the country.

The report and accounts were adopted; and the meeting terminated with the usual votes of thanks.

FATALITY IN A SEWER AT NOTTING HILL.

On Tuesday, the 18th ult., two members of the Metropolitan Fire Brigade, named William M'Laren and Robert Frederick Libby, and a sewer man named William Parry, employed by the Kensington Borough Council, lost their lives in a sewer at Pembridge Place, Notting Hill. While several men were at work in the sewer, they became unconscious. The Fire Brigade were summoned to endeavour to rescue them, with the result stated above. An inquiry into the circumstances was opened on the 22nd ult. by Mr. Luxmore Drew; the London County Council being represented by Mr. J. W. Godfrey, and the Gaslight and Coke Company by Mr. C. Beasley Robinson (of Messrs. Monier Williams, Robinson, and Milroy).

Charles Longford, a sewerman, deposed that, acting on the instructions of his foreman, he went to the sewer on the day of the accident, and got down to about 250 feet, where there was a junction. He detected a faint smell of gas. He then saw Washington, another sewerman, coming along with the body of a fireman on a truck. He said he was "done;" and he [witness] helped to get him to the entrance. He found the body of Libby about 3 yards from where he entered the sewer, and helped to get it out. The sewer was 3 ft. 9 in. high and 2 ft. 6 in. wide. Dr. Robert Stollard Kennedy said he was present when the body was recovered. He did not then ascertain the cause of death; but he witnessed the *post mortem* examination. Dr. Bernard Henry Spilsbury, Pathologist at St. Mary's Hospital, Paddington, said he had made a *post mortem* examination, in the presence of Dr. Kennedy and others, of the body of Parry, and the conclusion he came to was that the deceased was a well-nourished man. He gave details of the examination, and said the organs and the muscles all had a bright red colour. The blood was fluid and had a similar colour, and contained a large excess of carbon monoxide gas. The cause of death was coma due to carbon monoxide poisoning. The Coroner: That is coal gas. Dr. Spilsbury: Not necessarily. Alfred George Peck, a sub-officer of the Fire Brigade, described the finding and recovery of the body of Libby. Dr. Spilsbury said he had made a *post mortem* examination, and the cause of death was similar to the other case—coma due to carbon monoxide poisoning. Walter James Newberry, a member of the Fire Brigade, described the finding of the body of M'Laren, who was then breathing; but he subsequently succumbed. Dr. Spilsbury having stated that the cause of death was the same as in the other cases, the inquiry was adjourned till the 7th inst.

NEWMARKET PUBLIC LIGHTING CONTRACT.

The Electrical Engineer's Views.

The recent competition between gas and electricity (in which the former was successful) for the public lighting contract at Newmarket was recalled at the annual meeting of the Electric Light Company some days ago, in the course of a report submitted by Mr. Frank A. Simpson, the Engineer.

Mr. Simpson remarked in his report that last year tenders for public lighting in the district, for periods of five, seven, or ten years, came before the Urban District Council. He need scarcely point out that their Company were under a great disadvantage in tendering as compared with the Gas Company, since, had the Electric Light Company secured the contract, they would have had to face a capital expenditure of £4000 or £5000 upon laying mains throughout the district, and upon additions to their plant. This rendered it quite impossible for them to tender for a shorter period than ten years. For this period, nevertheless, they were able to offer what he ventured to claim would be a better system of lighting than Newmarket had ever had before, at only £4 12s. more than the Gas Company's tender, which, for ten years, showed the big reduction of over £120 per annum, as compared with their existing contract price, while the Electric Light Company offered a lighting system which, they submitted, would bear favourable comparison with the existing gas-lights, at £870 2s. 6d. per annum, or £235 odd less than the price under the existing contract. The Gas Company's tender was accepted by the votes of only five out of the thirteen members of the Urban Council present. The fact that the Gas Company's price for a five-year contract was £100 more than they were willing to accept for ten years was significant. They knew that the Electric Light Company were not in a position to compete against them for a five-year term. No doubt the public had noted the great reduction in the cost of public lighting, and the large increase in candle power given, since the Electric Light Company first entered into competition for the contract. Had they secured the contract on this occasion, the Electric Light Company would have laid mains all over the district, and would thus, in future, have been able to compete against the Gas Company for public lighting upon equal terms. The Council had, therefore, thrown away a golden opportunity of effecting in the future very much greater reductions in their lighting bill than they had been able to secure in the past. The fact that the ratepayers had mainly the Electric Light Company to thank for the large reductions which had been brought about during the last seven or eight years, need not be emphasized. The Company had recently reduced the price for current for heating and cooking from 4d. to 2d. per unit, and there was every reason to hope that the revenue from these sources and motive power would show a substantial increase in the near future. A number of their customers had found electricity to be the most economical and the most convenient form of motive power for machinery in occasional use.

SOUTH STAFFORDSHIRE WATER BILL.

Opposition on Behalf of Birmingham.

In their report to the City Council, the Birmingham Water Committee state that, on the publication of the South Staffordshire Water-Works Company's Parliamentary Bill and the deposited plans, it was found that the Company proposed to sink two wells, one within the drainage area of the Plant's Brook, and the other to the north of it. Plant's Brook is one of the old sources of supply of the department, capable of yielding up to 4 million gallons of water per day. The works are retained as an auxiliary supply in times of pressure. The Committee are advised that the sinking of the two wells would interfere materially with the yield of the brook, and that the interests of the Corporation would thereby be seriously prejudiced. They accordingly instructed the Town Clerk to lodge a petition against the Bill; and arrangements are being made to oppose the measure in Parliament. Another provision in the Bill has reference to the transfer from the Company to the Corporation of the rights of water supply in the district of Quinton. The Bill proposes the sanction by Parliament of the agreement entered into with the Company, and already approved by the Council, for the transfer of the district from the Company to the Corporation. The petition of the Corporation states that in this respect they support the proposed legislation. The Committee recommend that their action in petitioning against the Bill be approved, and that they be authorized to take such further steps in the matter as they consider advisable.

WATER SUPPLY OF NORTH LONDON.

A "Pollution" Scare.

Considerable alarm was caused in Hampstead on Monday last week by a report that the water supply of the district had become polluted. Many of the residents declared that they detected nothing wrong with the water; but a good proportion of the others stated that they noticed a disagreeable smell and taste of paraffin. It was stated by most of those who observed the unpleasant taste in the water on Sunday that next day it had much improved, and was almost normal. Officials of the Metropolitan Water Board promptly investigated the matter; and one of them was instructed to call on residents throughout the district affected to convey the assurance that the supply was absolutely safe, and that no harmful effects could follow the use of the water.

On Wednesday the Board issued the following statement in regard to the matter: "The disagreeable taste in the water supplied to Hampstead and adjacent districts arose from the sudden development of a vegetable growth—algæ, which appears to have been due to unusual climatic conditions. Immediately the trouble arose, investigations were made by Dr. Houston, the Board's chemical and bacteriological expert, for the purpose of locating its origin. This was traced to a few filter-beds, which were at once shut down, and all the other beds placed under close observation, with the result that, reporting on the 25th of March, Dr. Houston was able to say that the water at the filter-beds had been quite sweet for more than 24 hours. But complaints continued from the Hampstead district, owing to the back-flow from the service reservoir into which the original tainted water had been pumped. These service reservoirs have since been emptied and refilled with non-tainted water; and it is hoped that the difficulty has been entirely overcome. It is satisfactory to be able to state, on the authority of Dr. Houston, whose knowledge in these matters is unrivalled, that the water remained safe for drinking purposes, notwithstanding its extremely disagreeable taste. Precautionary measures have been taken for enabling the difficulty to be immediately dealt with in the event of further algæ troubles arising."

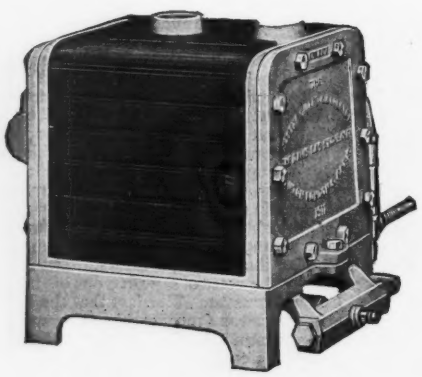
NEW WATER SUPPLY FOR NEATH.

The members of the Neath Rural District Council recently paid a visit of inspection to their extensive new water-works at Ystradfellte, which are now nearing completion. A temporary supply was turned on, and the permanent supply will be available later in the year.

In 1902 the Council obtained parliamentary powers to borrow £150,000 for water-works purposes, and the site selected was an area three miles above the village of Ystradfellte, 13 miles from Brecon, and nearly 2000 feet above sea-level. Here a dam 110 feet high has been constructed across the valley, and the reservoir will have a depth of 104 feet. The new works will supply the whole of the Neath area; and the Aberavon Town Council and Briton Ferry District Council have agreed to take a supply. The work was commenced in 1909 by Messrs. Morrison and Mason, of Glasgow, with Mr. E. H. Hill (Messrs. G. H. Hill and Co.) as Engineer, and Mr. W. S. Beecher as Resident Engineer. It was found necessary to bore a tunnel under a portion of the mountain in order to divert the river; and the Council went to Parliament again for further powers for an additional loan of £50,000 in order to meet the increased cost. These powers were secured; so that the cost of the works will be upwards of £200,000.

The reservoir will have a storage capacity of 645 million gallons—sufficient to last a drought of 200 days; and on an average of 20 gallons per head per day it will supply 3 million gallons per day to a population of 150,000. The temporary supply will yield a million gallons per day to each district. Each of the parishes that are supplied will have separate distributing plant. The Neath District Council will derive a revenue of £6500 per annum, which will more than provide for the repayment of the capital and interest. It is stated that within two years from the completion of the works the scheme will be self-supporting.

Nothing So Compact



as our Gilled Circulator is to be found among specialities marketed for a similar purpose.

Another feature calling for special comment in connection with this proved and tested apparatus is its

Absolute Accessibility

without disconnecting Gas and Water Pipes.

All these qualities combine to make the Gilled Circulator as nearly perfect as possible on the score of

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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The visit of the Juniors of both sections to Stirling on the 22nd was a very successful one. As Mr. Wilson pointed out, the change in the last twenty years in the gas-works was very great. To those who knew the works before the advent of the Smith family, there is now no likeness. From old-fashioned works, all is changed to an up-to-date place, where machinery does, as far as it can in works of the size, all the irksome labour formerly done by the workmen. The members were hospitably entertained by the Directors, who were represented at the festive board by Mr. Kinross. It is a pity that the opportunity was not taken of arranging a visit to the many interesting and historical buildings in Stirling, as, although many saw some of these, the light had partly failed, and the full beauty could not be observed. The tea might have been held later, and then the views could have been seen in full daylight. In arranging visits to works of the size of Stirling, it should be remembered that, when the available trains arrive early, the works will have been examined by an hour which will allow of other visits, if there are places in the neighbourhood which it would interest the members to see.

Edinburgh.—Miss E. M. Dods, M.C.A., has been giving a series of gas cookery demonstrations in Smith's Rooms, Leith, for the Edinburgh and Leith Gas Commissioners. The opportunity was also taken for showing a large number of cooking, heating, and lighting appliances, which were explained by the attendants in charge.

The Firemaster of Edinburgh places electric lighting and power circuits and gas lighting on an equal footing as regards causes of fire; while paraffin lamps are slightly under these two illuminants. This, of course, is as regards the number of cases during the past year; but the percentage of accidents in relation to the number of lights would show a very different result.

Glasgow.—Bailie W. B. Smith, who gave a lecture under the auspices of the Smoke Abatement League on "The Necessity of a Purer Atmosphere," said that if the atmosphere could be kept pure, Glasgow might become a holiday centre to which people might come from the country to spend a few days, and that if the increased application of gas for heating and cooking purposes continued at the present rate, this might be accomplished in a few years.

Aberdeen.—At a meeting of the Gas Committee on Wednesday, under the convenership of Mr. Sangster, the salary of Mr. Samuel Milne, the Gas Engineer and Manager, was under consideration, and it was agreed to increase it by £50 per annum. Cordial testimony was borne to the efficient way he had discharged the duties of Manager, and a statement was submitted showing the development and extension of the works since 1892. The salary of the Assistant-Manager was also increased by £25. A retiring allowance was at the same time made to Mr. Alexander Troup, who has been in the service of the Gas Department for 19½ years. A main is to be laid to a part of Seafield.

Burntisland.—An exhibition of gas cooking and heating appliances will be given by Messrs. R. & A. Main, Limited, in the Music Hall. Miss E. M. Dods, M.C.A., will give demonstrations daily in the afternoon and evenings, and information regarding the various exhibits will be furnished by the attendants. Provost Kirke will open the exhibition on Tuesday afternoon.

Dunfermline.—The rival schemes of the Town Council and the District Committee appear to have been settled at a meeting on Thursday; and although no official information is to be obtained, it is understood that the Town Council will withdraw their application for a Provisional Order, and that the District Committee shall supply all water in the Rosyth area, according to the quantity required, which will be measured by meter. These terms are to be submitted to a special meeting of the Dunfermline Town Council. The probable settlement is said to be due practically to the influence of Provost Husband and Mr. R. W. Wallace.

Galashiels.—The Town Council have now received a report of Mr. Parsons on the question of the introduction of electric power for supply to the manufacturers in the town. The latter have always thought that they could get this supply at the rate of ½d. per unit; but Mr. Parsons does not consider this possible in Galashiels, and he estimates the minimum cost at the beginning to be ¾d. per unit. A conference has been held between the Council and the manufacturers, which has been adjourned for further consideration. It is estimated that the cost of the scheme will be somewhere about £30,000. It is curious that nearly all the newspapers in reporting this matter have referred to it as the "lighting scheme," although it is not intended to do more than supply power.

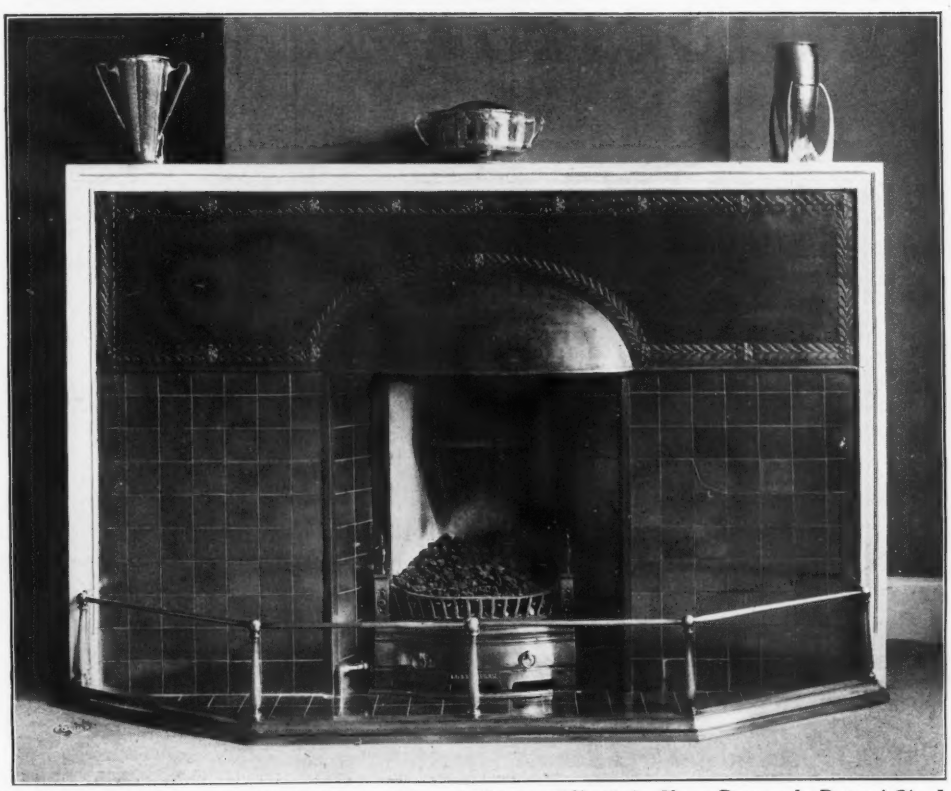
Innellan.—A proposal has been brought forward to light the shore road by Bullwood between Dunoon boundary and Innellan lighting area. For this purpose it would be necessary to extend the latter area, which is under the Cowal District Committee of the County Council. There is likely to be strong opposition on the part of the Innellan ratepayers, on account of the cost of the scheme.

Langholm.—It is stated that the new water-works are expected to be completed this year, despite the delay owing to the shortage of labour and to the bad weather.

Tayport.—The Gas Committee of the Town Council have been holding an exhibition of cooking and heating appliances at the Temperance Hall, where a number of exhibits of the apparatus manufactured by Messrs. John Wright and Co., of Birmingham, have been on view.

The Lea Recorder Company (manufacturers of water-measuring apparatus) has been registered with a capital of £12,000, in £1 shares, 6000 of which are preference shares.

A BEAUTIFUL "LIBERTY" FIREPLACE.



Fitted with our patent "St. Nicholas" Gas Fire at Messrs. Liberty's Show-Rooms in Regent St., London.

R. & A. MAIN, Ltd., LONDON & FALKIRK.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, *March* 29.

Throughout the week there has been more or less of a holiday feeling in the market, and the chief characteristic has been the lack of animation in this material. Middlemen, having covered their requirements for March shipment, are apparently in no hurry to buy more, unless at some reduction in price; while direct consumers also seem to be well supplied. The closing quotations are £13 18s. 9d. per ton f.o.b. Hull, £14 per ton f.o.b. Liverpool, and £14 2s. 6d. per ton f.o b. Leith. For future delivery no fresh first-hand transactions have been reported. Makers continue to quote £14 per ton f.o.b. the principal ports over the second half of the year, but there are no buyers at this figure; dealers being willing to sell at considerably less money.

Nitrate of Soda.

The market for this article remains steady on spot, Liverpool, at 12s. per cwt. for ordinary and 12s. 1½d. for refined quality.

Manchester District Tar Prices.

It is officially announced that the average price realized for February deliveries of tar in the Manchester district—based on the value of the products—was 40s. 4d. per ton.

LONDON, *March* 31.

Tar Products.

There is little alteration in the market for tar products, and business on the whole is quiet. Pitch maintains its price, though there is not much inquiry in the market at the present moment. Ninety per cent. benzol is very firm, and the quantity being used for petrol purposes is no doubt increasing daily. Solvent naphthas are steady, though business is difficult to negotiate. Heavy naphthas are in fair demand, and the price remains about the same. Sales are reported in crude carbolic at lower figures, and consumers are not very anxious to make purchases at the present moment. Creosote is steady, and the price remains unaltered.

The average values during the week were: Tar, 31s. to 35s. Pitch, London, 50s. to 50s. 6d.; east coast, 49s. 6d. to 50s.; west coast, Clyde, 49s. 6d. to 50s.; Manchester, 49s. to 50s.; Liverpool, 49s. 6d. to 50s. Benzol, 90 per cent., naked, London, 11½d.; North, 11d. to 11½d.; 50-90 per cent., naked, London, 10d. to 10½d.; North, 10d. Toluol, naked, London, 10½d. to 11d.; North, 10d. to 10½d. Crude naphtha, in bulk, London, 5½d. to 5¾d.; North, 5d. to 5½d. Solvent naphtha, naked, London, 1s. 1d. to 1s. 1½d.; North, 1s. 1d. f.o.b. Heavy naphtha, naked, London, 11½d. to 1s. f.o.b.; North, 10d. to 10½d. f.o.b. Creosote, in bulk, London, 3¼d. to 3⅜d.; North, 3⅛d. to 3¼d. Heavy oils, in bulk, 3½d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 7d. to 1s. 7½d. Naphthalene, £5 to £9; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

This market remains quiet; and although there has been a little buying for prompt delivery, it has not had any effect whatever. Makers do not appear to be quite so firm in their idea as to the value for the forward position, and are more willing to contract than was the case a short while back. Outside London makes are quoted at £13 5s.; Leith, £14 1s. 3d.; Hull, £13 18s. 9d. to £14; Liverpool, £14; Middlesbrough, £13 18s. 9d.

COAL TRADE REPORTS.

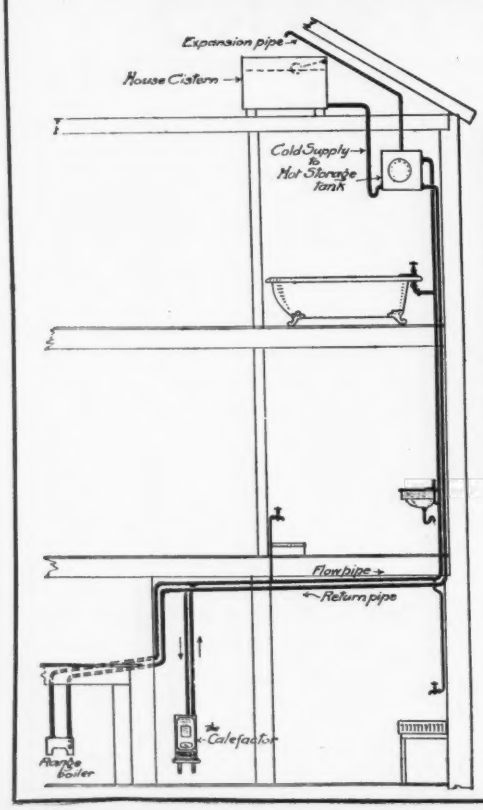
Northern Coal Trade.

The coal trade in the north-east is active, and should now settle down to steady work; and with the approach of the Baltic season, the demand should increase. In the steam coal trade, the prices are firm. Best Northumbrians are from 15s. 9d. to 15s. 10½d. per ton f.o.b.; second-class steams are from 14s. 9d.; and steam smalls are somewhat scarce at 10s. 6d. to 11s. 1½d. The production is now nearly normal, and is well taken up, to make up for the interruption in the holiday period. In the gas coal trade, the demand is well maintained, and the prices are generally steady. Best Durham gas coals are from 15s. 3d. to 15s. 6d. per ton f.o.b.; second-class gas coals are 14s. 10d. to 15s.; and "Wear specials" are from 15s. 7d. to 15s. 9d. The stiffening in the freight markets is making coals a little dearer at some of the Mediterranean ports, for which there is a demand for single cargoes of gas sorts. The contracts are now settled for Riga—some 12,000 tons of Durham gas coal having been so far bought. The exact price has not been officially declared; but it is believed that the figures for best and seconds will be similar to the current quotations, though the rates of freight in the shipping season may influence the result. Tenders are now under consideration for the supply of some of the needs of gas companies in the South. Gas coke is not quite so plentifully produced, and thus is slightly firmer.

Scotch Coal Trade.

Although during the past week the demand throughout Scotland has not been so keen, values have been well maintained. On Friday, the following were the prices quoted on the Glasgow Coal Exchange: Steam coal, 13s. 6d. to 14s.; splint, 14s. 9d. to 15s. 3d.; ell, 13s. 9d. to 14s. 3d.; trebles, 13s. 9d. to 14s. 3d.; doubles, 13s. 6d. to 14s.; and singles, 13s. 3d. to 13s. 9d., f.o.b. Glasgow.

THE CALEFACTOR FOR DOMESTIC HOT WATER SUPPLY.



The CALEFACTOR is easily connected to work with an existing coal range boiler, which may be used or not as desired.

The diagrams show the CALEFACTOR connected to a Tank and also to a Cylinder System; in either case a Thermostat gas valve can be used.

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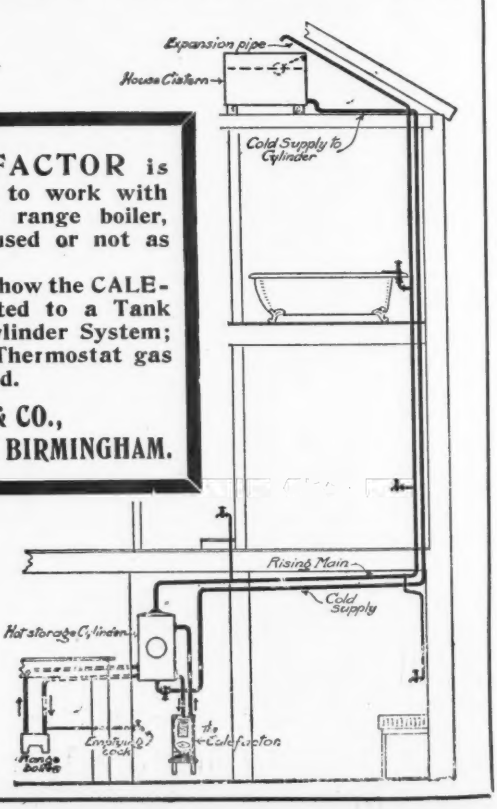
Essex Works, BIRMINGHAM.



The Fatal Explosion at the Rueil Gas-Works.

It was announced in the last number of the "JOURNAL" that the gas-works at Rueil, near Paris, belonging to the Compagnie L'Union des Gaz, had been damaged by fire, and that two lives had been sacrificed. From some particulars in regard to the occurrence contained in the last number to hand of the "Journal de l'Eclairage au Gaz," it appears that the fire was preceded by an explosion in the outlet governor chamber, which is below the office of the Manager (M. Lhomme), who at the time was fortunately absent, conducting some experiments with a new system of lighting. The building was a single-storey one, occupying about 1000 square feet, and it was very soon in flames. Moreover, it had been partly wrecked by the explosion. As saving it was out of the question, the attention of the firemen was directed to protecting the gasholder, which was not far off. After three hours' labour, all danger had passed, and the firemen confined their efforts to quenching the burning ruins. Unfortunately, there were six people injured, three of them seriously, and the *concierge* and his son were killed. The two latter were, it is stated, engaged in cleaning the Manager's office when the explosion occurred; and their bodies were found among the wreckage. The station was only used for distribution, all the gas being made at Nanterre; and the effect of the accident was temporarily to interrupt the supply of gas to the 24 communes served. The explosion occurred on a Saturday evening about seven o'clock; and by the following Monday gas was available in some of the communes, and by Tuesday in the rest. M. Lhomme had a lucky escape, on which he will receive the congratulations of his numerous personal and professional friends.

Cromer Gas Company.—At the recent ordinary general meeting of this Company, the Directors reported an increase of 449,500 cubic feet, or 2 per cent., in the sale of gas last year, and a profit of £1143. The balance standing at the credit of the profit and loss account was £143; and this the Directors recommended should be carried forward. It was decided last December to reduce the price of gas from 4s. 4d. to 4s. per 1000 cubic feet, and at the same time a liberal scale of discounts to large consumers and users of gas for motive power and industrial purposes was sanctioned, the concessions to come into force on Jan. 1, 1913. Improved methods of business were now being introduced, and efforts made to realize every possible economy in connection with the conduct and working of the undertaking and increase the sales of gas, &c. The report was adopted. The Secretary (Mr. P. E. Hansell) will retire on the 30th of June next; and Mr. F. Smallbone has resigned his seat on the Board, and been appointed as Manager and Engineer of the Company—Mr. E. L. Burton being made Managing-Director. In proposing a vote of thanks to the officers, Mr. Burton remarked that the Company were fortunate in having secured the services of Mr. Smallbone, and said he should be disappointed if at the end of the year they were not able to show substantial improvement as the result.

Lower Water-Level in London Wells.

The Geological Survey have lately issued a memoir entitled "Records of London Wells," compiled by Mr. G. Barrow and Mr. L. J. Wills. During the last few years, an exceptionally large number of borings to obtain water have been made within the London area; and the details given by the authors should prove of much value to engineers and others concerned with questions of water supply. In comparing the lists of old and new wells, a marked lowering of the water-level was apparent. Two instances of interest to dwellers in London show the nature and consequence of the fall. The fountains at Trafalgar Square are, or were, supplied by three wells, sunk close to the National Gallery. These wells once served not only the fountains, but also most of the public buildings in Whitehall, Millbank Prison, and the Houses of Parliament. They were completed in 1847, when the water-level had fallen to 78 feet below sea-level; but the yield still amounted to 580,000 gallons a day. The water-level steadily fell. First the supply to the Government offices ceased, and Millbank was demolished. Later the supply to the Houses of Parliament stopped; and now only one of the fountains carries a supply, yielding 8000 gallons an hour, and the water-level has fallen to 195 feet below sea-level, or more than 115 feet in 64 years. The fountains at the head of the Serpentine, in Kensington Gardens, are also supplied from a deep well, which was sunk in 1864. The water-level then was 45 feet below sea-level. It has now diminished to 138 feet, and the yield is only 1480 gallons an hour. A deep well near Piccadilly Circus, in contrast with one at Oxford Circus, indicates that at the former site the top of the chalk is 193 feet below sea-level, and at the latter 84 feet below. There is very little difference in the water-level, though there is more than 100 feet difference in the level of the top of the chalk.

Metropolitan Water Board's Deficit.—A special meeting of the Metropolitan Boroughs Standing Joint Committee and representatives of other constituent authorities on the Water Board was recently held in the Guildhall to consider the situation created by the proposal to issue a precept to meet the Board's deficiency to March, 1912. Sir T. Vesey Strong presided over a large and representative gathering. On the motion of the representative of the Borough of Hampstead, a resolution was carried to the effect that an appeal be made to the Board to promote a Bill with the object of removing any doubt as to the legal liability of the Metropolitan Boroughs to contribute towards the accumulated deficiency. A further resolution was carried to the effect that the districts not represented on the Board that take a supply of water in bulk from the Board's sources should be made liable to contribute a fair share towards any deficiency in the finances. It is reported that the Corporations of London and Westminster have already included sufficient in their estimates to meet their contribution to the deficiency; but neither has yet decided to pay, and several boroughs are in favour of contesting the matter in the Courts.

Additional Service for the Gas Cooker—Richmond's "UNIVERSAL" Plate Rack

THE reward for the time and thought we gave to the construction of our patent **Plate Rack** on its introduction some years ago is evidenced by the increasing demand for it. There can be no question as to its utility, the proof is already too pronounced for doubt.

Consumers appreciate the additional service of this simple accessory and use the cooker more freely where it is fitted.

It has often prevented a stove coming back to store.

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Progress of the Exmouth Gas Company.

The report presented by the Directors at the annual meeting of the Exmouth Gas Company last Wednesday showed that during the year 1912 ordinary stock to the value of £4000 had been issued at a satisfactory premium; and with the capital thus raised the area of supply had been extended to Lympstone, where a considerable demand for gas had been found to exist. The business had been well maintained, and but for a rearrangement of the accounts, which would not affect future years, the balance of profit would have been greater. The Chairman (the Rev. C. R. Carr) referred to the anxieties which had been caused during the year by labour troubles, and said that legislative interference, which sounded very plausible, had in practice pleased neither the masters nor the men who agitated for it. Gas companies lay at the mercy of coalowners; but a tax on the foreigner would not hurt them, while it would help the people of this country, and prolong the life of the coalfields, besides assisting to reduce the burden of taxation. Owing to the uncertainty of the outlook with regard to the cost of coal, and the less favourable contracts now available, the Directors could not reduce the price of gas as they would like to do. Profits were still further encroached upon by the payments under the National Health Insurance Act and by the increased cost of materials of all kinds. It was gratifying to see that the demand for gas was undiminished. Company after company reported increased trade; and the Exmouth Company shared in this experience. The coal strike did a great service in leading people to appreciate the cheapness and convenience of gas for cooking, heating, and power purposes; and it was likely to become more and more the fuel of the future. There had been quite a phenomenal increase in the use of gas-cookers. As against the high price of coal, there was an appreciable set-off in the larger amount obtained for residuals. The improvements in the plant at the works were being fully justified in the results obtained. The report was adopted.

Growing Demand for Gas at Devonport.—An inquiry was held at Devonport on Friday, by Mr. W. O. E. Meade-King, with reference to an application by the Corporation for the sanction of the Local Government Board to a loan of £5659 for the purposes of the gas-works. Mr. W. P. Tervet (the Gas Engineer) explained that the money was required for mains in a district which was being opened up. All the mains were new, and the sizes would be 6, 4, and 3 inch. The Inspector, referring to the detailed schedule of the cost, said the prices seemed rather high, and Mr. Tervet replied that since the last extension of mains the cost of labour and material had increased considerably. The Inspector inquired if the gas-works had been extended to meet this additional supply. Mr. Royle (the Assistant Town Clerk) said no extension was necessary at present. They were able to cope with any demand which was in prospect; and if the need arose for more plant, there was ample room for its installation.

Leamington Priors Gas Company.—Dr. T. W. Thursfield (Vice-Chairman) presided, in the absence of the Chairman (Mr. Edward Wright), at the half-yearly meeting of this Company last Friday. The Chairman said the Company had had a very successful half year; there having been an increase of 6½ per cent. in the quantity of gas sold. This was due chiefly to the larger number of cookers fixed during the coal strike and the coming into favour of the gas-fire. The Company had carbonized 11,984 tons of coal, which made about 135 million cubic feet of gas. There were in the district 53½ miles of main, 2865 prepayment meters, 3700 ordinary meters, and 3653 cookers. A dividend of £1 per share was paid on "A" shares, 14s. per share on "B" shares, and 7s. per share on "C" shares.

Additional Water Supply for Boyle.—The Boyle (co. Roscommon) Water Committee recently had before them proposals for securing an auxiliary water supply; the Engineer (Mr. C. Mulvaney) recommending the pumping of a supply from a well, known as St. Patrick's Well, to the existing Summit Reservoir. Mr. Thorpe (the Chairman) suggested that the services of a water diviner should be obtained; and Mr. T. J. Devine urged that water should be pumped from the local river, filtered, and sent into the reservoir. Mr. Mulvaney said he had no confidence in diviners; and, objecting also to the river supply, he argued that filter-beds in a small town always got out of order and led to disease. It was pointed out that Sir Charles Cameron, of Dublin, had condemned the river water. Ultimately it was agreed that, failing the discovery of an ample spring, the new supply should be taken from the river, and, after filtration, pumped into the reservoir.

Annfield Plain and District Gas Company.—The accounts of this Company for the year ended Dec. 31 showed a net profit of £3271, and a sum of £1433 available for distribution. This allowed of the payment of a dividend of £7 7s. per cent., with a balance of £190 to be carried forward. At the close of the past year there were 3444 consumers—an increase of 233 in the twelve months. In moving the adoption of the report and accounts at the recent ordinary meeting, the Chairman (Mr. W. A. Schultz, J.P.) stated that the quantity of gas sold last year was 32,327,200 cubic feet, compared with 27,588,000 cubic feet in 1911; being 4,739,200 cubic feet, or nearly 18 per cent., more. The consumers took on an average 8500 cubic feet each; but, as the use of gas became more general in the district, the Directors hoped to see this considerably increased. He congratulated the shareholders on the result of the year's working. The Company's Bill of last session received the Royal Assent on the 7th of August, and under it the capital had been increased to £100,000. They had £50,000 of it unissued, which should be sufficient to meet all their requirements for some years to come. The report was adopted. In the course of his remarks, the Chairman referred sympathetically to the loss the Company had sustained by the death of Mr. W. C. Parkinson, one of the first Directors appointed under their Act. He said it was an honour to the Company that Mr. Parkinson had lent his name to its establishment.

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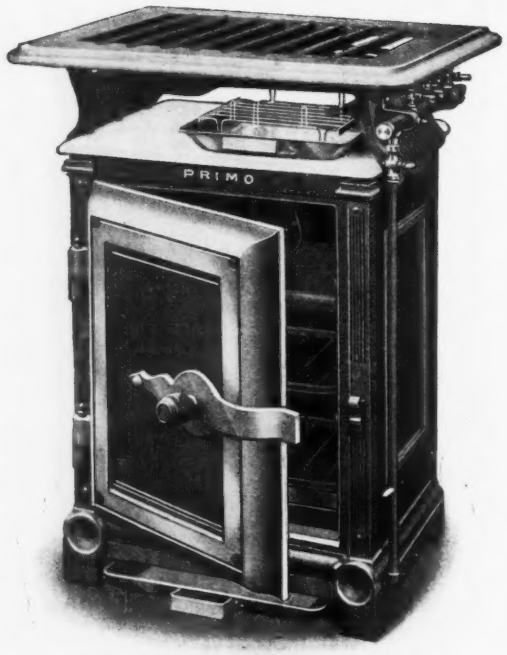

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Strike at the Barrow Gas-Works.—The strike of gas-workers at Barrow, which commenced on the 13th ult., continues, and is causing very great inconvenience in the town. Attempts have been made to carry on the works with imported labour, but without success. Clerks and others of the staff have kept the plant going; but the supply of gas is very poor.

Bombay Gas Company, Limited.—At the meeting of this Company on the 10th inst., the Directors will report an increase last year in the sale of gas both to private consumers and for the public lamps—the additional revenue from this source being £2713. There was also a greater return by £668 from residual products. The profit for the year was £21,436; and the amount available for distribution is £26,879. After allowing for the interim dividend, and placing £734 to reserve, there remains £18,344, out of which the Directors recommend a dividend of 4½ per cent. (less income-tax), making 7½ per cent. for the year. This will leave £5744 to be carried forward.

Cheaper Gas at Southport.—The Southport Corporation Gas Committee have decided to reduce the price of gas to a uniform flat-rate of 2s. 6d. per 1000 cubic feet. The charges at the present time are 2s. 8d. for lighting and 2s. 6d. for power and heating. The change means a concession of between £3000 and £4000 per annum to the gas consumers; but the Committee nevertheless still hope to be able to hand over £13,000 towards the relief of the rates, as in previous years. As Birkdale has now been incorporated with Southport, this amount will be spread over the larger area, instead of Southport alone, and will be equivalent to a relief of only about 6½d. in the pound, instead of 8½d. as formerly.

Prescot Gas Company.—The annual general meeting of this Company was held last Wednesday—the Chairman (Mr. Henry Cross) presiding. The Directors reported that there had been an increase of 2½ per cent. in the gas consumption last year; and, so far as profits were concerned, it was a record year. They intended reducing the price of gas from the 1st of April by 2d. per 1000 cubic feet, making the price 1s. 11d. to 2s. 10½d. net. The meeting closed with a vote of thanks to the Engineer, Manager, and Secretary (Mr. John E. Hall), who stated that during the last fifteen years the quantity of gas sold had trebled, and the capital had been reduced from £934 to £590 per million cubic feet of gas made.

Brighton (Victoria) Gas Company, Limited.—The profits on the working of this Company in the half year ended Dec. 31 amounted to £4272; and out of the £7983 available for distribution the Directors, at the half-yearly meeting, recommended a dividend at the rate of 6 per cent. per annum. This came to £1800; £1080 was placed to the renewals account; and £5103 was carried forward. The business of the Company continues to progress satisfactorily; the sales of gas in the six months comprised in the accounts showing an increase of 21 per cent. over those for the corresponding period of 1911. The works, plant, and machinery, under the supervision of the Engineer and Manager (Mr. H. V. Mitchell), were kept in good order.

Bursting of a Great Reservoir.—News reached England early last week of the occurrence of disastrous floods, attended unfortunately by great loss of life and destruction of property, in Ohio and Indiana. An Exchange telegram from New York on Thursday conveyed the message that the reservoir at Lima (Ohio), stated to be the largest artificial body of water in the world, had broken, and had flooded the city, which has a population of 6000.

Sale of Shares.—At a recent local auction sale, there were offered 13 £10 shares of old capital (last dividend 10 per cent.) and 50 £10 shares of new capital (last dividend 7 per cent.) in the Newmarket Water-Works Company; 25 £10 shares in the Newmarket Electric Light Company (last dividend 4 per cent.); and £290 consolidated stock of the Newmarket Gas Company (last dividend 6¾ per cent.). The 13 water-works shares (old capital) realized £24 10s. per share; while the new capital sold at from £14 10s. to £14 per share. For the 25 £10 shares in the Electric Light Company, an offer of £160 was refused. The Gas Company's stock was submitted in lots of £50, and realized from £70 10s. to £70 per lot.

Gas and Electricity Supply in New York.—In the sixth annual report of the Public Service Commission of New York State for the First District, figures are given showing the earnings from the street lighting systems of New York City. For the year 1911-12 the public paid $60,581,760, or about $12 per head, for gas and electricity. The total capitalization, including capital stock and funded debts outstanding, of all companies subject to the jurisdiction of the Commission amounts to $1,104,993,683; gas companies standing for $210,952,600, and electric light and power companies for $136,968,751. The number of gas consumers was 1,286,717—an increase of about 50,000 over the preceding year, and of 201,231 over the year 1908-9. The gas manufactured amounted to 43,297,216,000 cubic feet; and 589,778,573 units of electricity were generated.

Tavistock Gas Company.—The annual meeting of this Company was held last Thursday—Mr. T. Doidge, the Chairman, presiding. The Directors reported that the receipts for gas had been more than maintained, while the yield from the sale of residuals had been good. The profit on the revenue account was £1202. An interim dividend, absorbing £540, was paid in October; and the Directors recommended a final dividend at the rate of 4s. 7d. per share on the ordinary capital, and 3s. 2½d. per share on the additional capital, free of income-tax. The Chairman, in moving the adoption of the report and accounts, said the past year had been a record one with respect to the output of gas, due in a great measure to the prepayment installations, which the Directors would continue to encourage. The report was adopted, and the dividends recommended were declared. A vote of thanks was accorded to the Manager (Mr. C. Stapleton) and the Secretary (Mr. W. D. Eddy), for the very efficient way in which they had studied the interests of the Company. Mr. Stapleton, in reply, referred to the good feeling prevailing at the works and to the loyalty of all the employees.

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Water Scheme for Donaghadee.—It has been reported to the Donaghadee (co. Down) Urban District Council that the contract for the new water scheme is almost settled, and that the works will probably be commenced during the current month.

Bideford Water-Works Extensions.—Sanction has been given by the Local Government Board to the Bideford Town Council's proposal to spend £18,400 on extending and improving the water-works. The Council have instructed Mr. Baldwin Latham to prepare specifications and quantities for a new reservoir, excavating the old reservoir, and the other works required.

Alliance and Dublin Gas Company.—The accounts for the half year ended the 31st of December, which were presented at the meeting of this Company yesterday, showed that the total revenue amounted to £163,552, and the expenditure, including interest on loan capital, &c., to £127,464; showing a profit of £36,088. From this, a sum of £2000 was written-off the suspense account; leaving a balance of £34,088. To this was added £3672 carried from the previous account—making a total of £37,760 to the credit of profit and loss account. The Directors recommended a dividend on the consolidated ordinary stock at the rate of 5 per cent. per annum, after payment of which a balance of £1226 remained to be carried forward.

Water Supply in Holland.—According to the Engineering Supplement to "The Times," a new water supply has recently been provided for 28 communes in the South Beveland Island and for the villages of Ossendrecht, Woensdrecht, and Hongerheide on the right bank of the Eastern Scheldt. The supply is derived from five tube wells, 8 inches in diameter, and capable of delivering about 650,000 gallons of water daily, situated to the east of Ossendrecht. The plant includes two pumps driven by a 60 H.P. Diesel engine. After being filtered, the water is conveyed by conduit, 12 inches in diameter and 23 miles long, into a tower of 275,000 gallons capacity, erected almost in the centre of the island, near the town of Goes. The distribution system is designed for 30,000 inhabitants; and the scheme has involved an expenditure of upwards of £120,000.

Londonderry Gaslight Company.—Mr. H. J. Cooke, presiding at the meeting of the Londonderry Gaslight Company, said that they had come through a trying year very well, and had every reason to be pleased with the result. The gas consumption had been the largest in the history of the undertaking. The report was adopted, and the usual dividends were declared—10 and 7 per cent., less income-tax, on the old and new shares respectively. A vote of thanks to the Directors and officials was acknowledged by the Chairman and Mr. R. J. Skinner (Manager and Secretary).

Projected Large Storage Reservoir for Belfast.—At a recent meeting of the Belfast City and District Water Commissioners, Mr. W. T. Braithwaite was elected Chairman, in succession to Mr. J. Hollywood. In returning thanks, Mr. Braithwaite said that their Engineer was preparing plans for the construction of a large storage reservoir in the Silent Valley, Kilkeel (co. Down), where they had a catchment area of about 8000 acres, which had been declared by two of the leading water experts of the kingdom to be the finest they had ever inspected. This reservoir would hold about 3000 million gallons; so that it would be equal in capacity to the one lately opened by the King at Chingford. A member suggested that probably when the reservoir was completed the King might be asked to declare it open.

Coggeshall Water a Cure for Rheumatism.—At the meeting of the Braintree Rural District Council last Wednesday, it was stated that the water supplied from the Coggeshall and Kelvedon Water-Works would cure rheumatism if drunk in sufficient quantity. According to the "Daily Mail," Dr. A. Turner, of Kelvedon, has found that during the three years the neighbourhood has had the water rheumatism has decreased in a marked degree. He puts this down to the rare purity of the water, which is pumped from a depth of 400 feet, and to the potassium salts it contains. He says: "No one knows the source from which it derives this property, but it probably picks it up from some strata before passing over the chalk beds. It possesses qualities somewhat similar to the Harrogate waters. In my practice I have found that the drinking of the waters facilitates medical treatment."

GAS COMPANIES' STOCK AND SHARE LIST.

The Stock Exchange had a bright and buoyant week to mark the reopening after the Easter holiday, and all markets at the close showed a welcome advance in strength. It was not achieved, however, without a pause now and then, as if to suggest the advisability of some caution, and to hint that, although actual events at the seat of war predisposed to an early conclusion of peace, yet the general political horizon of Europe was far from free of ominous clouds. However, sufficient for the day was the brightness thereof, and business went ahead right merrily. The tone at the opening on Tuesday was resolutely good. All factors were judged to be favourable, and Consols set a good lead with a rise of ⅜. Other markets cheerfully followed suit. On Wednesday, it was the same; markets being buoyant with pleasant auguries of the long-deferred pacification in the East. Consols gained another 5/16; and all gilt-edged things were strong. Rails were in active demand, though the last prices were not the best; and Americans, after oscillating nearly all day, effected a material advance. On Thursday, the rising tide was at about high water; markets revelling in the unaccustomed buoyancy. Government issues and other gilt-edged securities were strong, and Consols had a further rise. Rails expanded freely, with better prices all round. The only weak spot was American, as a result of the disastrous floods. A change was apparent on Friday; the opening revealing hesitation and less confidence in the Near Eastern outlook which set markets back a bit. But soon a better tone supervened, followed by almost complete reassurance; so that markets recovered and closed firm. This attitude was not maintained on Saturday, and misgivings arose as to an early realization of the long hoped-for peace. Markets in general were less firm, and Consols were weaker, closing at 74¾ to 74½—an advance of ⅝ in the week. In the Money Market, there was a fair demand, but no shortness of supply, and discount rates eased. Business in the Gas Market was a very fair average, considering the holiday-tide and the short week. Movements in price were few in number and slight in degree; and the general tone was quite satisfactory. In Gaslight and Coke issues, the ordinary was in good demand and active. Transactions ranged from 101⅞ to 102¾—a rise of ½. In the secured issues, the maximum changed hands at 81 and 82, the preference at 96½ and 97¼, and the debenture at 72½ to 74. South Metropolitan was quiet and firm, realizing from 112 to 113¾; and the debenture marked 74½. In Commercials, a small parcel of the 4 per cent. was done at 104¾. Among the Suburban and Provincial group, Bournemouth "B" realized 15¾, Brighton original 205¾, and South Suburban from 117½ to 118¼. In the Continental companies, Imperial changed hands at 172½ to 173½, European at 18½ to 18⅝, and Malta at 4⅝. Among the undertakings of the remoter world, Bombay was marked at 6 15/16, Melbourne at 100¾, Primitiva at 6¾ to 6 15/16, ditto preference at 4 15/16 to 5 1/32, and River Plate debenture at 93½.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,561,868	Stk.	Oct. 11	5	Alliance & Dublin Ord.	75—80	..	6 5 0
374,000	,,	Jan. 16	4	Do. 4 p.c. Deb.	83—86	..	4 13 0
280,000	5	Oct. 11	7½	Bombay, Ltd.	6½—7	..	5 7 2
50,000	10	Feb. 27	15	Bourne- / mouth Gas / and Water	28½—29½ / B 7 p.c. / 15½—16½ / Pref. 6 p.c.	..	5 1 8 / 4 6 8 / 4 4 3
332,000	10	,,	7				
75,000	10	,,	6				
380,000	Stk.	Feb. 27	14	Brentford Consolidated	260—265	..	5 5 8
330,000	,,	,,	11	Do. New	200—205	..	5 7 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	113—115	..	4 6 11
206,250	,,	Dec. 12	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
217,380	Stk.	Feb. 27	11	Brighton & Hove Orig.	205—210	..	5 4 9
244,200	,,	,,	8	Do. A Ord. Stk.	150—154	..	5 4 7
530,000	20	Mar. '28	12½	British	44—45*	..	5 11 1
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	99—91	..	4 7 11
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	91½—93½	−½	4 5 7
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—
160,000	10	—	—	Do. 4½ p.c. Pref.	4—5	..	—
100,900	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	78—83	..	5 8 5
157,150	Stk.	Feb. 13	5	Chester 5 p.c. Ord.	107½—109½	..	4 11 4
1,513,280	Stk.	Feb. 27	5/9/4	Commercial 4 p.c. Stk.	104—106	..	5 3 1
560,000	,,	,,	5½	Do. 3½ p.c. do.	101—103	..	5 3 6
475,000	,,	Dec. 12	3	Do. 3 p.c. Deb. Stk.	71—73	..	4 2 2
800,000	Stk.	,,	4	Continental Union, Ltd.	84—87	..	4 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	130—132	..	5 6 1
492,270	Stk.	—	5½	Derby Con. Stk.	124—125	..	4 12 0
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
1,002,140	10	Jan. 16	10	European, Ltd.	18—19	..	5 5 3
16,415,840	Stk.	Feb. 13	1/17/4	Gas- / light / and / Coke	4 p.c. Ord. / 3½ p.c. max. / 4 p.c. Con. Pref. / 3 p.c. Con. Deb.	191½—193½ / 80—83 / 98—99 / 72—75	+½ / 4 4 4 / 4 0 10 / 4 0 0
2,600,000	,,	,,	3½				
4,962,235	,,	,,	4				
4,674,850	,,	Dec. 12	3				
258,740	Stk.	Mar. 13	5	Hastings & St. L. 3½ p.c.	87—91	..	5 9 11
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	16½—16⅝	..	6 11 4
131,000	Stk.	Mar. 13	7½	Ilford A and C	153—155	..	4 18 4
65,780	,,	,,	6½	Do. B	120—122	..	5 0 5
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
4,940,000	Stk.	Nov. 14	9	Imperial Continental	171—176	..	5 2 3
1,935,000	Stk.	Feb. 13	8½	Do. 3½ p.c. Deb. Red.	85—87	..	4 0 6
200,242	Stk.	Mar. 13	6	Lea Bridge Ord. 5 p.c.	120—123	..	4 17 7
561,000	Stk.	Feb. 27	10	Liverpool United A	218—220	..	4 10 11
718,100	,,	,,	7	Do. B	155—157	−½	4 9 2
806,083	,,	Dec. 30	4	Do. Deb. Stk.	98—100	..	4 0 0
63,480	Stk.	Jan. 16	3	Maidstone 3 p.c. Deb.	68—70	..	4 5 9
75,000	5	Nov. 28	6	Malta & Mediterranean	4¼—4⅜	..	6 6 4
250,000	100	Oct. 1	4½	Met. of Melbourne / 4½ p.c. Deb.	99—101	..	4 9 1
541,920	20	Oct. 30	8½	Monte Video, Ltd.	12¾—13½	..	5 5 8
1,775,892	Stk.	Feb. 27	4½	Newc'tle&G'tesh'd Con.	99½—100½	−1	4 9 7
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	85—86	..	4 1 5
55,940	10	Feb. 27	7/7/)	North Middlesex 7 p.c.	13—14	..	5 4 7
300,000	Stk.	Nov. 28	8	Oriental, Ltd.	125—130	..	6 3 1
60,000	5	Mar. 28	10	Ottoman, Ltd.	8—8½*	..	5 17 8
60,000	50	Feb. 27	13	Portsea, Island B	125—128	..	5 1 7
100,000	50	,,	12	Do. C	122—125	..	4 16 0
249,980	5	Oct. 11	8	Primitiva Ord.	6¾—7	..	5 14 4
499,960	5	Dec. 30	5	,, 5 p.c. Pref.	4⅝—5⅛	..	4 17 7
521,600	100	Dec. 2	4	,, 4 p.c. Deb.	96—98	..	4 1 8
346,198	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	92—94	..	4 5 1
275,000	5	Apl. 12	12	San Paulo, Ltd.	13—14	..	4 5 9
150,000	10	Sept. 27	6	Do. 6 p.c. Pref.	11½—12	..	5 0 0
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49—51	..	4 18 0
135,000	Stk.	Mar. 13	10	Sheffield A	226—228	..	4 7 9
209,984	,,	,,	10	Do. B	224—226	..	4 8 6
523,500	,,	,,	10	Do. C	224—226	..	4 8 6
90,000	10	Sept. 27	7½	South African	10—11	..	6 16 4
6,429,895	Stk.	Feb. 13	5/9/4	South Met., 4 p.c. Ord.	112—114	..	4 15 10
1,895,445	,,	Jan. 16	3	Do. 3 p.c. Deb.	74—77	..	3 17 11
209,820	Stk.	Feb. 27	8½	South Shields Con. Stk.	160—162	..	5 4 11
952,795	Stk.	Feb. 27	6	S'th Suburb'n Ord. 5 p.c.	117—119	..	5 0 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	116—117	..	4 5 6
117,058	,,	Dec. 30	5	Do. 5 p.c. Deb. Stk.	117—119	..	4 4 0
594,740	Stk.	Nov. 14	5	Southampton Ord.	102—105	..	4 15 3
120,000	Stk.	Feb. 13	7½	Tottenham / and / Edmonton	A 5 p.c. / B 3½ p.c. / 4 p.c. Deb.	..	5 2 1
483,940	,,	,,	5¾			115—117 / 92—94	+1 / 4 18 3
149,470	,,	Dec. 30	4				4 5 1
182,380	10	,,	5	Tuscan, Ltd.		5—6	.. 8 6 8
149,900	10	Jan. 2	6	Do. 5 p.c. Deb. Red.		96—98	.. 5 2 0
236,476	Stk.	Feb. 27	5	Tynemouth, 5 p.c. max.		115—116	.. 4 6 2
255,636	Stk.	Mar. 13	6¼	Wands- / worth	B 3½ p.c. / 3 p.c. Deb. Stk.	137—140 / 63—70	.. 4 18 2 / .. 4 5 9
85,766	,,	Dec. 30	3				

Prices Marked * are "Ex. Div."

Fatal Gas Explosion.—An explosion occurred last Sunday afternoon in a house at Hebburn-on-Tyne, and its force was such that a man named Collinson and a woman named Gray were blown through part of the ceiling. The woman died on removal to the Infirmary, and the man succumbed in the evening. Three other persons living in the house sustained injuries. The effect of the explosion, which was caused through an escape of gas, was to blow out the windows of the dwelling, the windows of a house next door, and also others in some houses adjoining. Altogether eight tenements were wrecked. It appears that gas was not used for lighting purposes in any of the damaged houses; but it is supposed that there was an old gas-pipe in the building in which the explosion occurred.

Under the title "O. H. N. Gases, Limited," a company has been formed with a capital of £20,000, in £1 shares, of which 5000 are founders', to acquire certain patents granted to Professor Pictet for improvements in the manufacture of hydrogen and other gases for lighting, heating, and other processes, and for processes used in connection therewith.

The Kirton Gas Company, Limited, has been registered with a capital of £5000, in £1 shares, to take over the business of a gas company carried on by Mr. E. J. Brockway, of Cleethorpes, at Kirton, in Lincolnshire, and the neighbourhood.

At a meeting of the Doncaster Town Council in Committee on Thursday last, tenders were considered for further extensions at the gas-works. That of Messrs. Beastall and Sons, for the erection of a new retort-house, stores, and extensions, was accepted; the amount being £4100. The tender of Messrs. Drakes, Limited, of £3095, for a retort-bench, was also accepted.

In connection with the proposals of the Cleckheaton Urban District Council for the erection of new gas-works, the first of the Local Government Board sanctions has just been received, covering an outlay of £21,198 for the purpose. The total expenditure on the scheme is estimated at £40,000; and it is expected that further borrowing powers will be obtained as soon as the Provisional Order for which the Council have applied has been granted. The present sanction is under the powers conferred by the old Order. The capacity of the new installation is to be 750,000 cubic feet of gas per day; and it will be possible to extend the plant when necessary to a capacity of a million cubic feet daily.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

CONSULTING ENGINEER. Clonmel Gas Committee. Applications by April 10.
WATER WORKS FOREMAN. Winchester Water and Gas Company.
YARDMAN, &c. No. 5716.

Appointments, &c., Wanted.

LEADBURNER. No. 5715.
LONDON GAS OR MANUFACTURER'S OFFICE. No. 5714.

Plant, &c. (Second-Hand), For Sale.

GAS COMPRESSOR. Laddite Mantle Company, Kingston-on-Thames.
HYDRAULIC MAIN, DIP, BRIDGE, AND ASCENSION PIPES, MOUTHPIECES, &c. Stane and Dykehead Gas Company.
WASHER-SCRUBBER. No. 5711.

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EXHAUSTER AND ENGINE. No. 5704.

Tank Trucks for Hire.

FREDK. G. HOLMES AND CO., Northfleet.

Patent Licences.

PYROPHORIC ALLOYS. Abel and Imray, 29, Southampton Buildings, W.C.

Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. London Mart. April 15.
DORKING GAS COMPANY. London Mart. April 15.
ST. MARGARETS GAS COMPANY. London Mart. April 15.
SOUTHAMPTON GAS COMPANY. By Tender. April 15.

Stocks and Shares—*continued.*

UXBRIDGE GAS COMPANY. London Mart. April 15.
WYVENHOE GAS COMPANY. London Mart. April 15.

TENDERS FOR

Coal.

MORECAMBE GAS DEPARTMENT. Tenders by April 5

Sulphuric Acid.

BURY CORPORATION. Tenders by April 12.

Tar and Liquor.

CUDWORTH GAS DEPARTMENT. Tenders by April 9.

Washer-Scrubber.

BURY CORPORATION. Tenders by April 12.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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See Illustrated Advertisement Feb. 11, p. 428.

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

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TAR Wanted. Fredk. G. Holmes and Co., Tar Distillers, Thames Tar Works, Northfleet.

FOR Renovating Cooking Utensils and Polishing Gas-Cookers and Gas-Fittings, read Canning's Handbook on Electro-Plating and Polishing. Fully illustrated, Price 2s. 3d., post free; abroad, 2s. 6d.

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"GUIDE to Patents, Trade Marks and Designs," Sixth Edition, 1913, just published. Send immediately for free copy, giving full and up-to-date information. Chapters on "How to Patent an Invention;" "Warnings;" "Successful Inventions;" "Value of Foreign Rights;" "How to Exploit;" &c. Inclusive fees for this Country and Abroad. J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, London. Established 29 years.

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Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

DISMANTLING Gas Plant.—Gas Companies having Old Plant to Dispose of or to Dismantle, either for Purchase or Removal, Firth Blakeley, Sons, and Co., Limited, Church Fenton, Leeds, are prepared to Contract for the same.

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APPLICANTS are Informed that the Vacancy HAS NOW BEEN FILLED, and are THANKED for the trouble they have taken in the matter.

H. Kendrick,
Engineer and Manager.

Gas-Works, Stretford,
March 28, 1913.

WANTED—Employment in London Gas or Manufacturer's Offices. Advertiser's Services would be valuable where a considerable quantity of printed matter is used. Could be useful in a Position at forthcoming Gas Exhibition. Is personally known to Mr. King.

Address No. 5714, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

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CONSULTING ENGINEER WANTED.

THE Gas Committee of the Clonmel Corporation require the Services of a Qualified GAS ENGINEER, to Advise the Committee generally, and to act in the capacity of Consulting Engineer if required.

The Committee contemplate the building of a new Retort-House and Coal-Store combined, complete with Modern Retort Settings, &c., capable of producing 160,000 Cubic Feet of Gas per Diem, with room for Extensions.

The person appointed will have to prepare Plans and Specifications for proposed Extensions.

Applicants to state Terms.

Applications to be addressed to the Chairman, Edmund Burke, Esq., Alderman, Gas-Works, Clonmel, on or before April 10, 1913.

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CUDWORTH URBAN DISTRICT COUNCIL.

THE Cudworth (near Barnsley) Gas Committee are prepared to receive TENDERS for the Purchase of about 60 Tons of TAR and about 120 Tons of AMMONIACAL LIQUOR over the next Twelve Months.

Further Particulars may be obtained from the Manager.

Tenders, endorsed "Tender for Tar" and "Tender for Liquor," to be addressed to W. E. Raley, Esq., Regent Street, Barnsley, and to reach him not later than Wednesday, the 9th of April, 1913.

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TO SULPHURIC ACID MAKERS.

THE Corporation of Bury invite TENDERS for the Supply of about 400 Tons of SULPHURIC ACID for the Manufacture of Sulphate of Ammonia, during a period of One Year from the 1st of May, 1913.

Form of Tender and Conditions may be obtained upon Application to the Engineer and General Manager, Gas-Works, Bury.

Sealed Tenders to be sent to the Town Clerk, Bury, not later than April 12, 1913.

COUNTY BOROUGH OF BURY.

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Further Information may be obtained on Application to the Engineer and General Manager, Gas-Works, Bury.

The Contractor will be required to Conform with the Standard Rate of Wages Clause adopted by the Corporation.

Sealed Tenders, endorsed "Washer-Scrubber," to be Delivered to the Town Clerk, Bury, not later than the 12th of April, 1913.

Price 3s. 6d. *net., post free in the United Kingdom.*

A GOOD SUGGESTION

It has been suggested that Gas Undertakings should send to each of the

MEDICAL MEN and NEWSPAPERS

in their Areas of Gas Supply, a copy of

"COMPETITION POINTS FOR GAS SALESMEN"

(Written and Compiled by ARTHUR F. BEZANT)

Calling their special attention to the sections dealing with Eyesight, Hygienic Aspects, Oxygen and Gas Consumption, Stagnant Air and Electric Lighting, Ventilation and Lighting and Heating by Gas and Electricity.

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